



FRIDAY, MARCH 16, 1900.

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Contributions.

An Economical Freight Train Speed.

Troy, N. Y., March 13, 1900.

To the Editor of the Railroad Gazette:

I am sorry I failed to make my meaning clear in my letter on "An Economical Freight Train Speed," and I am sorry that I fail to entirely grasp the criticism of "X" in your issue of March 9. It may be that the following statement will make my meaning clear to him and to any others interested, who have found the same difficulty.

The limiting speed of 10 miles an hour is not fundamental to the discussion, and the table of speeds given was merely to exemplify the theory. If 6 miles an hour be assumed as the proper minimum speed, other numerical results than those of the table of February 2 will result, but the theory will in no way be changed. Indeed, the letter of February 2 stated that 10 miles an hour might not be the proper minimum speed to assume. My own judgment is that 10 miles is a proper speed to assume for usual conditions, but if it is found by practice that 5 miles or 6 miles can be counted on with safety as a usual thing, then 5 miles or 6 miles should be used.

The theory advanced was simply this: The design of the locomotive, the rate of the ruling grade, and the arrangement of the gradients fix the economical speed for any division of any road.

This theory has been amply substantiated by actual operation on the Northern Pacific Railway described by Mr. McHenry in the Railroad Gazette of March 2, and it is perhaps worthy of mention that in this instance the result of a theoretical discussion has been endorsed by approved practice. It should also be noted that this theory and practice had been worked out on the Northern Pacific before my development was thought of, but the Northern Pacific practice was unknown to me at that time.

WILLIAM G. RAYMOND.

Railroad Engineering at Columbia University.

March 10, 1900.

To the Editor of the Railroad Gazette:

My attention has been directed to a description on page 139, March 2, of your valuable journal, of the opening day of the Mechanical Laboratories of Columbia University. The article is appreciated, but a statement appears in its second paragraph, which is not in accordance with the facts in the case and for which I bespeak your attention. It says: "No regular instruction will be given the present school year in railroad engineering, but preparations for a regular course in the fourth year are being made," etc.

If the statement had been made that no regular instruction is given in locomotive engineering, it would have been nearer correct, since the practice at Columbia is to divide the instruction in the railroad field into two natural and logical divisions; the separation taking place at the line of the rails. The department of Mechanical Engineering which is under review in your article, is concerned with the locomotive and machinery part of railroading, while the department of Civil Engineering concerns itself with the permanent way, structures, alignment, etc., devoting attention specially to students in the course for the degree of Civil Engineer. The course in permanent way and location covers ma-

sonry structures, foundations and bridge engineering, and a very effective practical course in field methods is given in the Summer School of Surveying at Litchfield, Ct., which has been for many years an important feature of the Civil Engineering work. Preliminary investigations and surveys are made with thoroughness, and a line of three miles in length is finally located by a party of ten men who prepare maps, plans and profiles, including earth work, making estimates and drawing up specifications for putting the work under contract.

In the senior year, the broader problems involved in economic location, operation, maintenance, organization and management are treated, with attention also to the history of railroad development.

The department of mining covers also the problems of the permanent way, which are involved in the processes of excavation and tunneling, and the application of electricity to street railroads as a specialty of the Electrical Engineering department.

F. R. HUTTON,

Professor of Mechanical Engineering.

Modern Steel Rails and Modern Rail Joints.

Philadelphia, March 1, 1900.

To the Editor of the Railroad Gazette:

In the interesting articles on "The Modern Steel Rail" in your recent issues, failures and poor wear in service have been referred to, and the whole matter treated as though the rails in the track were continuous lines of metal without any joints; that is, the weakest points in the track were not mentioned, notwithstanding many of the failures take place at these points. Actual tests show that with an ordinary pair of splice-bars, the strength at the splice is only thirty per cent. of the strength of the rail. In these tests the rails were not held down to get the value of the ends as cantilevers, as this would be the same for all splices in use, except where an additional bearing is given by the splice-bars to distribute the load on abutment ties. In ordinary practice the rail joints give the most trouble; it requires seventy per cent. of all the track work to be put at these points to keep them in order. This is shown by careful records kept by some of our leading roads.

In your article on the "M W 100 per cent. Rail Joint," in issue of January 19th, you state, "a remarkable fact seems to have been observed lately, namely, that with strong lateral bracing at the joints, such as would prevent any sideways yielding, there is a tendency to throw the trains from side to side and cut the sides of the rail-head unevenly. The importance of this very interesting fact will now be developed in comparative trials."

This statement is in direct opposition to all ideas of what is required of a good joint; the rails are held rigidly at all intermediate bearings on the ties, and why should they not be held in the same rigid manner at the ends? To obtain this lateral as well as vertical rigidity has been the main point governing the design and construction of the "Bonzano" joint, which does hold the rail at the ends in line laterally, as well as in line vertically when the train passes over it, the main object being to give the same action at the ends as at other parts of the rail, and make the line as far as possible a pair of continuous rails, with, of course, provisions for expansion. There really must be some error in your statements regarding the objection to holding the rail ends in line laterally, as several miles of track with the "Bonzano" joint have been in use on the Pennsylvania Railroad main lines for the past twenty months, and an order has just been given for joints of same pattern for forty additional miles of track. This seems to prove that the joint as made has given satisfaction.

The modern method of shaping steel in dies for cars, car trucks, splice-bars, and many other purpose renders it unnecessary for the engineer to rely on the shapes as rolled, and he can obtain much better results from same weight of metal by forcing it into the form best suited for the work it has to do. Advantage has been taken of this to the greatest extent in the "Bonzano" joint and its manufacture by first having an angle splice-bar rolled with thickened top to give the wide bearing surface required to take the load from under side of head of rail, and an extra wide flange to give an increased bearing surface on abutment ties, preventing the rail from cutting into them and keeping it in line laterally. The bars, after being cut to length and punched cold, are heated, and the flange at center bent down from a horizontal to a vertical position, making a much deeper girder than at the ends, giving the strength to carry a vertical load where it is most needed. This load is transferred to the abutment ties by a strong gusset-shaped tie that also forms a bracket and keeps the web in a vertical position, and the flange on the abutment ties in a horizontal position. This disposition of metal gives the greatest possible lateral strength at the ends, and vertical stiffness at the center of splice-bars for a given weight of metal—each part being so designed as to do useful work, there being no cutting and no waste of metal. The bars are very much benefited by the

heating for the last operation of bending down the flange, as it removes all the injurious effect of the punching by annealing the metal surrounding the punched holes, and also corrects any distortion on the bearing surface caused by punching. The great simplicity of this joint and what it covers is well set forth in the following portion of a letter recently received from one of my engineering friends, which I take the liberty of quoting:

"As to the small bridge of your devising, I do think that, since the first Northern savage made the first snow-shoe, and since Columbus stood the egg on end, this rail-joint takes the lead for perfect simple adaptation of means to an end. My memory covers about 50 years of railroad work. In that time many have been the inventors of rail joints, and it is certainly phenomenal that, after all have tried and failed, A. B. should come along and do the business with that simple kink." A. BONZANO.

Wood Preserving in Germany.

In my letter of Jan. 26, which you published Feb. 9, I referred as proof of the value and efficacy of the Hasseimann system of wood preservation, to tests made by scientists, particularly those made at the Imperial Chemico-Physiological Experimental Laboratory at Klosterneuburg near Vienna, and at the Mechanico-Technical Laboratory of the Technical High School at Munich. I had intended embodying these reports in my letter, but overlooked them. I would now kindly request that you publish them as an addendum to my letter.

Reports from the Chemico-Physiological Laboratory at Klosterneuburg, near Vienna, by Professor Dr. L. Roessler—No. 1. On the Hasseimann system of impregnation. Dated Klosterneuburg, March 27, 1897.

According to the formula and under supervision of the inventor, Mr. Fritz Hasseimann, we subjected samples of wood to treatment by his system of impregnation, as per Austrian patent No. 46/4071. We treated all of the different woods at our disposal, such as oak, beech, maple (buttonwood) poplar, locust, pine, larch and grape-vine, varying in diameter from 3 to 15 cm. (1¼ to 6 in.). We treated the woods by both processes, the one consisting of two separate boilings (a first boiling in a solution of the sulphates of iron, copper and alumina, followed by a second boiling in a solution of calcium chloride with an addition of unslaked lime as per first patent) as well as by the system of one boiling, in a solution of the sulphates of iron, copper and alumina and "Kainit." The boiling was only done in open vats and not in closed cylinders under pressure, which is more thorough. By both processes the result of the treatment proved the claims made in the patent, that all woods (even pine and larch, which are the most difficult to penetrate) were evenly impregnated throughout the entire body. Microscopical and chemical examinations proved an even distribution of the chemicals of the impregnating liquid throughout the fibre and cell tissue of the various strata of the wood, there being no difference in young or older woods.

Report No. 2.—On the durability and permanence (power to resist atmospheric influences) of vine props treated by the Hasseimann system of impregnation. Dated Klosterneuburg, March 2, 1898.

The props treated as per report No. 13,993 of March 27, 1897, after air drying, were struck into the ground April 15, 1897. For the tests were taken a number of impregnated props of fir, pine, larch and oak, and for comparison an equal number of untreated props.

As conclusive results of the durability and permanence of such treated woods could not be arrived at in the short period of one year under natural conditions and circumstances, but would require subjection to atmospheric influences for several years, the conditions most detrimental were so magnified and increased by artificial means, that we can give a fairly authentic and reliable report in such a short time, based on the effects of conditions which were very much worse than the poles would ever be exposed to in the natural course of events.

To attain such conditions a row of the vineyard was selected which, for the greater part of the year, is saturated with moisture, the ground being thoroughly dry for a period of only two weeks in midsummer. In winter it is mostly frozen and covered with ice.

In this row the treated and untreated props were alternately driven in the ground April 15, 1897, and were carefully examined and tested March 1, 1898, after an exposure of almost eleven months. It was seen that the poles of all kinds of wood treated by the Hasseimann system were absolutely unaffected, the part of the pole buried under the earth having actually become considerably harder. No mold could be discovered on any of the impregnated poles. Particular attention was paid to the zone of division where the pole appears immediately above ground, experience having taught us that at this point the poles suffer most from micro-organisms and atmospheric influences. Absolutely no changes could be noticed at this point of the pole or elsewhere, excepting, as we proceeded in cutting the thin slices for examination, we noticed that the wood was perceptibly harder and tougher the deeper it had been buried in the ground.

The untreated props, which had been planted for comparison of effects, presented a very different appearance. The buried part of the fir and pine props had all become spongy and were covered with mold, and had become so soft that it could readily be picked to pieces by the finger nail. The larch props had also become spongy and soft, though not to so marked a degree as the fir, and were covered with mold.

The oak props were particularly affected at the line of division immediately above the ground. The result of these tests, extending over a period of eleven months under the most unfavorable conditions and circumstances, tend to verify our report of March 27, 1897, and prove the permanence and durability of wood treated by the Hasseimann system of impregnation, and that equally beneficial results would be attained by treating by this process wood for any other purpose.

Considering that the props tested were treated in the most crude manner, being merely boiled in open vats in the preserving liquor, without subjecting to pressure it warrants the assertion that the present improved system of Hasseimann should revolutionize the industry of wood preservation.

Report No. 3.—On the power of resistance to atmospheric and other influences of vine props treated by the Hasseimann system of impregnation. Dated Klosterneuburg, October 30, 1899.

In connection with our reports of March 27, 1897, and March 2, 1898, we report our further experience. The props referred to and more fully described in our report of March 2, 1898, though exposed to the most unfavorable conditions, the most extreme weather and soil conditions such as could never naturally occur, show today, October 30, 1899, after two and a half years of exposure to such exaggerated detrimental conditions the following results:

All of the untreated props of all the woods tested,

pine, fir, larch, beech and oak, are more or less decayed. The props of soft woods are so decayed that most of them broke off in attempting to draw them from the ground; those of beech and oak are so decayed that the parts buried under the soil can readily be picked to bits with the nail.

The props treated by the Hasselmann system are absolutely intact and sound, i. e., on none of these props of all different woods, could any deterioration be detected, either on the part buried underground, at the mark of division immediately above ground, or the exposed part.

A most astonishing and important fact is, that the props of soft wood, pine, fir and larch, show a resistance to atmospheric influences equal to that of the hard woods oak and beech, a fact which promises to be of the greatest importance. If we consider that under normal conditions props of soft wood have an average life of 3 or 4 years, while the average life of an oak prop is 13 to 15 years, and that under the magnified trying conditions of our tests, even the untreated oak props had begun to decay after 2½ years, while during this same period of time and under exactly the same conditions the soft wood props treated by the Hasselmann system show absolutely no signs of decay or mold, it is safe to assume that so treated soft woods will have a longer life than the best white oak, or more than 15 years. Such a result to our knowledge has never been achieved by any other method of impregnation.

The result of our tests of vine props is the same as in all cases where wood is continuously exposed to atmospheric and other destructive influences. Based on these tests as a foundation, we unreservedly declare, that we see in the impregnation of wood by the Hasselmann system, the most important progress in the utilization of wood to its full value, as well as in the method of impregnation.

Report of tests made at the Mechanico-Technical Laboratory of the Royal Technical High School at Munich.

In connection with the tests of various kinds of wood impregnated by the Hasselmann system (Report No. 153), of July 21, 1897, we have recently made further tests with pieces of larger dimensions than the first. The test pieces were furnished by the "Süddeutsche Impragnier Gesellschaft System-Hasselmann" and were delivered in October, 1898. The test pieces consisted of 12 sticks 11 x 12 and 16 x 9 cm. section, and from 2 to 5 m. in length, marked 1A to 6A and 1B to 6B. The pieces of same number were contiguous from the same tree. Of these the number marked A was the untreated piece, and the corresponding number marked B had been impregnated by the Hasselmann process.

From these sticks were cut test pieces for pliability, flexibility and power to resist pressure and strain, great care being exercised that the untreated and impregnated pieces of the same tree should be as near alike as possible as regards size, fibre and location of heart, etc. In pieces 3, 4, 5 and 6 the heart was in the center of the section and section showed 30 to 35 annular rings. Pieces 1 and 2, the heart was nearer to one side of the section, No. 2 showing 50 and No. 1 64 annular rings.

(Here follows a long table showing the results of numerous tests expressed in figures.)

Then follows the statement: From the result of these tests we conclude that none of the desirable properties of wood are in the least affected.

(Signed) Mechanico-Technical Laboratory of the Royal Technical High School, Föpl, m. p.

Some eight or ten years ago the inventor of this process treated by it the wood that was to be used for building of troughs, boxes, etc., for a fish hatchery for H. R. H. Prince Ludwig of Bavaria. At the time it was closely watched to see that none of the chemicals would be dissolved and prove injurious to the fish and their young. This did not happen, proving the chemical combination of the preserving agents and the fiber of the wood.

A thorough inspection recently made of the wood used in the above hatchery shows it to be as sound to-day as when put in 10 years ago, while other untreated wood, put in at the same time, has long since been replaced owing to decay.

A. G. WANIER.

New York, Feb. 10, 1900.

Maintenance and Inspection of Automatic Electric Block Signals.*

Track circuit sections should be from one-half to five-eighths of a mile in length; each section equipped with two electro-magnets, one of them being in series with the rails and battery, the other (which is of a higher resistance) being in multiple with the rails and battery, at the battery end. Two cells of gravity battery in multiple arc supply the energy for these circuits. One distant and one home signal on each circuit, normally at danger. A visual switch indication at each siding or crossover, normally at safety.

There should be a repairman and a batteryman to every 15 miles of double track. The headquarters of these men should be in the middle of the territory, where there is a day and night telegraph office, so that they can have free and easy access to the whole territory. On parts of the road where trains are few and fewer stops are made, and on busy parts of the road where infrequent stops are the rule, these men can cover the territory on foot in a short time. The men should keep with them at all times, while on duty, necessary tools to repair any bond wires which they may notice broken off. These men should do all the bonding, or superintend the work if too much for them to do in person, whether it be ordinary every day repairs, such as renewing rails and frogs, or relaying long stretches of track.

Each cell of battery should be renewed every fourth week, and the second week after renewal the zinc should be cleaned and a part of the zinc solution taken out, replacing it with clear water. Under favorable conditions these rules might safely be made to read "renewal" every six weeks and "patching" every third week. Zincs should have a large surface exposed in these batteries, the 4-lb. circular being about the best. These zincs should not be left in service after they are three-fourths consumed. No copper should remain in a track battery in continu-

ous service for more than three months. It should be removed and thoroughly dried. The accretions should be carefully removed, and on some subsequent trip the copper can be restored to service. The blue stone should be carefully washed and screened when washing these cells. All copper collections and refuse should be separated from the blue stone so as to leave it in first class condition.

Whenever practicable a given number of gravity signal batteries should be installed in which to use the zincs removed from track batteries. This is more economical than to sell the small zincs for scrap. In a signal battery these zincs can be used until they are ready to fall apart. A still better plan is to put this material in good condition and turn it over to the telegraph department for use in batteries. The Gordon No. 1 cell, Excelsior cell, or LaLande (all 6 x 8) are among the most economical and easiest to maintain on both signal and indicator circuits. They are clean, easily removed and non-freezing, and on account of their long life, great labor savers.

Every division of 75 miles of double track should be in charge of an inspector or foreman. The inspector should be required to renew all banners (in disk signals) when they become faded; see that relay contact points are kept clean and have an even and perfect contact at all times; that all relay points break properly; that the adjustment of instruments is not made without his personal supervision or knowledge; that all wires are kept properly protected against lightning; that all ground connections are in perfect order; that all batteries are properly renewed and at the proper time; that all alterations or changes in circuits are done properly so as to be safe and cause no unnecessary stops to traffic. He is also responsible for the hiring of proper men to maintain the system. He should report to the Division Superintendent and to the Signal Engineer.

Inspectors should be required to carefully test all circuits with a millimeter or some other suitable instrument and aim to keep all grounds and high resistances removed from the circuits. In this way leaks are detected before they lead to crosses or other defects in the circuits. Inspectors, repairmen and batteryman can make good use of their time while going over their territories by watching the operation of the various relays and signal instruments. Signals should at frequent intervals be tested by using some means of operating the signals and blocking them similar to a train movement. This is essential to finding many troubles and removing them without causing unnecessary stops.

All apparatus should be inspected once every month and a report made showing what defects were found and how remedied. Men should never be allowed to ride on trains, to "inspect." There is, however, a time when such a trip is advisable, and that is in stormy weather, to see that all signals are clearing properly or to see that lights are properly displayed.

With the practice and regulations as here outlined the average cost will be:

Cost per signal per year (labor and material).....	\$52.00
Cost per cell of track battery per year (material).....	2.05
Cost per cell of signal battery per year, with indicators (material).....	1.60
Cost per cell of signal battery per year, without indicators (material).....	.90
Cost per cell of signal battery per year, gravity cells (material).....	2.00

Pipe-Connected Signals.*

These were first used on the Pennsylvania in 1874, and for about ten years were the general and accepted practice for both home and distant signals. About 1884, after unlimited difficulties in getting wire suitable for the purpose, wire-connected signals were introduced; because they were thought to be a more economical appliance. Have they proved to be economical and safe? I do not think so. We need something that will give better satisfaction. The C. & E. I. has found satisfaction in pipe-connected signals. My experience is limited to pipe-connected home signals; but I would recommend that the distant signals be pipe-connected also. I am not a firm believer in distant signals, unless they are so connected, when manually controlled. There is some difference of opinion among signal men as to which of the two signals, home or distant, should be pipe-connected, or whether both signals should be so connected, and, if only one, which one. If we are to have but one of the two signals so connected, I would say, let it be the home signal. That is the controlling feature. The pipe-connected signal gives a precise and clear cut indication at all times, whether in the clear or danger position. There is no half-way indication about it. If trouble does arise, the towerman or repairman can find the trouble more easily than with the wire-connected signal. Again, with the anticipated change from a white to a green light for a clear signal, which I think will be universally adopted in the near future, it is at once desirable to have a signal that can be depended upon to give the proper indication. Some

have doubted the action of the signal should a break occur in the pipe line. I tested one signal connected by 475 ft. of pipe and all other necessary attachments—cranks, compensator, bolt lock, etc., from top of pole to and including the lever; 70 ft. of this line is on a 12° curve and 65 ft. being a transverse line across tracks to signal. The action of the signal was as follows:

Set in the clear position and disconnected at crank, it immediately went to danger. This was repeated at bolt lock, compensator and at lead out, from the lever, leaving rocking shaft attached. The result was the same. The 14-lb. counter weight on balance lever is so adjusted as to give the least possible resistance to the clearing of the signal, but can be adjusted to give greater resistance. It is, of course, a matter of construction as to whether it will take 10 lbs. or 40 lbs. to restore a signal to the danger position, on the length of line above stated.

The pipe-connected home signal costs approximately 30 per cent. more than the wire-connected signal, but approximately 80 per cent. less for maintenance. It is seldom, if ever, a pipe-connected signal needs any adjusting, if properly compensated. Wire-connected signals are a constant source of trouble on account of frequent failures from broken wires, freezing fast in low places in winter time, and the constant watching necessary by towerman and repairmen to keep them working and properly adjusted. A repairman's services are often needed when he is perhaps 50 or 100 miles away.

Every time a signal is out of service on any account we imperil the safety of our trains. The following will serve to show the average relative pulling power required to operate pipe and wire-connected signals:

Kind.	Av. length of line.	Connection.	Av. pulling power required.
Home	450 ft.	Pipe.	83 lbs.
Home	450 ft.	Wire.	80 lbs.
Distant	1650 ft.	Wire.	180 lbs.
Distant	1650 ft.	Pipe.	...

Cost of Carrying the Mails.

The Joint Congressional Commission which has been investigating the cost of carrying mails by railroad is expected shortly to issue its report; and the Chicago Tribune of March 10 publishes a review of the situation, giving facts which appear to have been taken from advance sheets of the forthcoming report. The purpose of the Tribune article, which fills more than three columns, is to show that the investigations of Prof. Henry C. Adams, who has been employed by the Commission, bring out facts which prove that the railroads earn very much more money, proportionately, for carrying mails than they do from carrying passengers; and a reduction of 25 per cent. in the rates is advocated. The Tribune gives the following tabulated matter, purporting to have been copied from Prof. Adams' report:

N. B. (Note a).	
Fixed rate for haul of 200 pounds of mail, average distance, a mile	\$9.77
Commutation rate for haul of one passenger and baggage (365 days), average distance, a mile.....	2.07
Commutation rate for haul of 200 pounds of first-class freight, average distance, a mile.....	1.37
N. B. (Note b).	
Fixed rate for haul of 300,000 pounds of mail, average distance, a mile.....	7,317.00
Commutation rate for haul of 300,000 pounds of passengers and baggage (365 days), average mail distance, a mile	3,121.02
Commutation rate for haul of 300,000 pounds of first-class freight, average mail distance, a mile.....	2,048.76
Annual revenues of a passenger car.....	\$10,528
Annual revenues of a mail car.....	15,586
Decline in freight rates since 1878.....	35 per cent.
Decline in passenger rates since 1878.....	17½ per cent.
Decline in mail rates since 1878.....	Nothing
Percentage of mail to gross railroad earnings (1878).....	1.879
Percentage of mail to gross railroad earnings (1898).....	2.747
Percentage of increase (1878-1898).....	46
Percentage of railway pay expenses to gross post office expenses in 1878.....	28
Percentage of railway pay expenses to gross post-office expenses in 1898.....	35.4
Percentage of railway pay expenses to gross post-office expenses, increase, per cent., 1878-1898.....	26
Gross passenger revenues, 1898.....	\$267,000,000
What gross passenger revenues would have amounted to in 1898 on mail basis of pay, that is, had there been no commutation discounts	80,000,000,000
N. B. (Note c).	
What a 25 per cent. reduction in pay to railroads would last year have saved the government	\$8,895,600

Explanatory notes—*a.* From 200 to 300,000 pounds is the variation between the lightest and heaviest mail routes.

b. Average haul of mails, 813 miles.

c. This saving would have eliminated a postal deficit of \$6,510,776, leaving in lieu thereof a surplus of \$2,284,833.

The railroad rates now in force are those established by Congress in 1878, which were five per cent. less than those in force in 1876; and those of 1876 were 10 per cent. less than the rates of 1873, which latter were, per mile of road per annum (on the basis of the average number of pounds carried through daily): 200 lbs., \$50 a mile; 500 lbs., \$75 a mile; 1,000 lbs., \$100 a mile; 1,500 lbs., \$125 a mile; 2,000 lbs., \$150 a mile; 3,500 lbs., \$175 a mile; 5,000 lbs., \$200 a mile, and \$25 additional for every additional 2,000 lbs. Also the railroads are allowed to charge an annual rental of \$6,250 a year for each post-office car constructed by them for the mail service.

It is argued that, as the 10 per cent. and 5 per cent. reductions mentioned were made because the volume of business increased, still larger reductions should be made now, because there has been a still further increase in the volume of business.

*A paper by H. S. Ballet, Supervisor of Automatic Signals, Lehigh Valley Railroad, read before the Railway Signalling Club at Chicago March 13.—Condensed.

*A paper by G. S. Pfasterer, Foreman of Signals, Chicago & Eastern Illinois, read before the Railway Signalling Club at Chicago March 13.—Condensed.

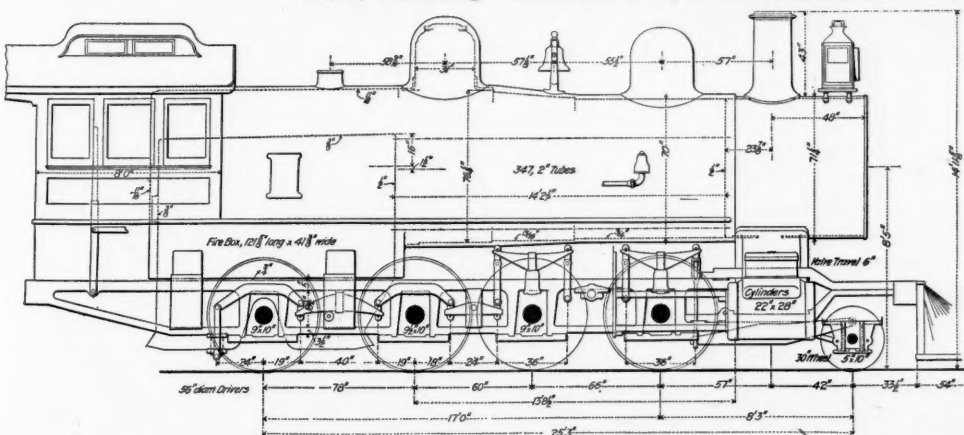
Prof. Adams finds that on the railroads of the United States the average annual passenger income per passenger car owned is \$10,528, while the average amount paid by the Government for railroad transportation per mail car per year is \$15,586, nearly 50 per cent. larger than the passenger-car income. There are running 881 full postal cars, and compartments in other cars estimated to amount to 1,318 full cars. In 1878 28 per cent. of the expenditures of the Post-Office Department went to the railroads, while in 1898 the railroads took 35.4 per cent., an increase of 26 per cent. in 20 years. During the same time the percentage of mail earnings to gross railroad earnings has risen from 1.879 in 1878 to 2.747 in 1898. He says that during the same time freight rates have declined 35 per cent. and passenger rates 17½ per cent. Prof. Adams estimates the average length of haul of mail at 813 miles. The basis on which this calculation is made does not appear.

While the Tribune does not at present claim that the Government ought to make a larger reduction than 25 per cent. in the mail pay, it is asserted that a reduction of three-fourths or more could be made and still leave a fair profit for the railroads.

Two Recent Locomotives from the Richmond Works.

The engraving from a photograph shows two engines recently turned out from the Richmond Locomotive Works. The big one is a consolidation for the Chesapeake & Ohio. This is the latest design of that company for freight engines, and it is one of 50 ordered from the Richmond Works. Twenty-five of these are now in service and the others are building. An outline drawing of one of the engines is here illustrated, and dimensions will be found in the table below:

Gage	.....	4 ft. 8½ in.
Fuel	.....	Bituminous coal
Weight on drivers	.....	167,500 lbs.
Weight in working order	.....	186,500 lbs.
Wheel base, driving	.....	17 ft. 0 in.
Wheel base, total engine and tender	.....	54 ft. 0 in.
Total length of engine and tender	.....	64 ft. 1 in.
Cylinder diameter	.....	22 in.
Piston stroke	.....	28 in.
" packing	.....	¼ in. cast iron snap rings
" rod diameter	.....	4 in.
" material	.....	Coffin steel
rod packing	.....	U. S. Metallic
Steam ports	.....	1½ in. x 2½ in.
Exhaust ports	.....	¾ in. x 2½ in.
Bridge width	.....	1½ in.
Slide valves, style	.....	Richardson
" greatest travel	.....	6 in.
" lap, outside	.....	1 in.
" inside	.....	0 in.
Lead in full gear	.....	¾ in.
Valve stem packing	.....	U. S. Metallic
Driving wheels, diameter	.....	56 in.
" centers	.....	50 in.
" material	.....	Cast iron
" box material	.....	Cast steel, tin facing
Crank pin, main	.....	Journal 7 in. x 6½ in. nickel steel
Engine truck, style	.....	Center bearing swinging bolster
wheels, diameter	.....	30 in.
Bolter	.....
Type	.....	Extended wagon top, radial stayed
Working pressure	.....	200 lbs.
Outside diameter, 1st course	.....	70 in.
Seams, circumferential	.....	Double riveted
" horizontal	.....	Butt and sextuple riveted
Firebox, length	.....	12½ in.
" width	.....	41½ in.
" depth, front	.....	72½ in.
" back	.....	70½ in.
" material	.....	Carbon steel
" water space, front 4 in., side 3½ in., back 3½ in.	.....
" crown stays	.....	1½ in., 4 rows heads inside
" stay bolts	.....	1½ in. and 1 in., not over 4 in.
centers	.....	4 rows sling

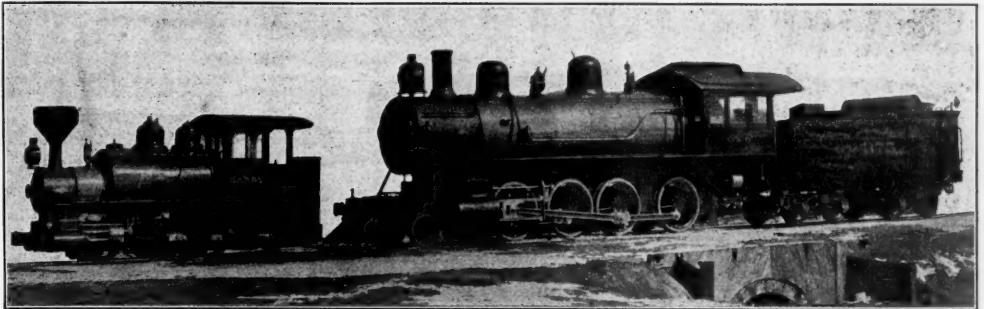


Richmond Consolidation for the Chesapeake & Ohio.

Tubes, material	.....	Charcoal iron
" length	.....	14 ft. 2½ in.
" number	.....	347
" diameter	.....	2 in.
Heating surface, tubes	.....	2,566 sq. ft.
" firebox	.....	239 sq. ft.
" total	.....	2,805 sq. ft.
Grate, style	.....	Rocking—C. & O. standard
" area	.....	36 x 15 sq. ft.
Exhaust pipe nozzle	.....	5½ in. diam.
Smoke stack, inside diameter	.....	15 in. at choke
" top above rail	.....	14 ft. 11½ in.
Feed water supplied by	.....	2 No. 10 Monitor, outside cab
Tender	.....
Weight, empty	.....	50,000 lbs.
Frame	.....	Iron
Wheels, number	.....	8
" diameter	.....	33 in.
" material	.....	Cast iron, chilled
Journals	.....	5 in. x 9 in. hammered iron
Wheel base	.....	15 ft.
Tank capacity, water	.....	6,000 gals.
" coal	.....	10 tons

The small engine was built for Mr. A. B. Hitchcock, of Emporia, Va., for logging. It is about one-

sixth the weight of the C. & O. consolidation, 33,000 lbs. being carried on the six 31-in. driving wheels, and has a total wheel base of 7 ft. 8 in. The cylinders are 10 in. in diam., with 16 in. stroke. The boiler is of the straight top, radial stayed type, with an outside diameter (first course) of 34 in. The working steam pressure is 150 lbs. per square inch. The firebox has the following dimensions: Length, 42 in.; width, 19 in.; depth, front, 43 in.; back, 37½ in. The grate area is 5¼ sq. ft. The total heating sur-



Two Recent Locomotives from the Richmond Works.

face is 297.85 sq. ft., 39.43 sq. ft. of which is in the firebox. Wood is used as fuel in this locomotive. The tank capacity for water is 400 gallons.

Car Shortage in Europe.

Under date of Jan. 6 a German paper says: "The general scarcity of coal has in the last few days grown still more serious on account of the interruption of traffic caused by severe frost and heavy snow-falls. The shops and factories that suffer the most do not hesitate to blame the Stat. Railroad authorities of Westphalia for the lack of foresight in not providing proper facilities. The sudden change of weather in Central and Western Germany has greatly aggravated the troubles. The trains are hours behind their schedules or entirely annulled, the yards are blocked, and connecting roads either refuse to receive cars or do not return the empty ones. It is hoped that the large coal consumers will learn their lesson and hereafter lay up coal in sufficient quantities to meet future possibilities of being cut off from their base of supply."

The car shortages during the month of December in the Ruhr coal district in Germany were officially given as follows: Dec. 14, shortage 11 per cent.; Dec. 19, shortage 18 per cent.; Dec. 22, shortage 29 per cent. On Dec. 23 the demand was 16,869 cars and the supply 11,945 cars, the percentage of shortage being almost the same as on the previous day.

The importance of ample switching and classification yard facilities has been demonstrated during the crisis. Under normal conditions 20 hours a day are needed at the switching yards in this district for making up the coal trains, and the severe weather during the latter half of December delayed the yard work so that it could not be finished in the 24 hours. The managers of the coal syndicate have recently

even spread so as to affect all industrial branches. The rolling mills are out of coal, the sugar factories are short of beets, the publishing houses and newspaper offices are endeavoring in vain to obtain their regular supply of paper. In Antwerp and other important seaports the car shortage has caused a general disturbance in the shipping. The merchants are complaining verbally and by letter, without results. The authorities have so far not taken any steps for relief, and if the matter is to pass through

the regular channels before the proper officials finally take action, the situation will be hopelessly mixed up.

"Although private shippers are almost entirely deprived of transportation for their supplies and wares, the Government itself is not inconvenienced for lack of cars. Eleven thousand tons of coal has been delivered by rail from Cardiff for Government use, and in anticipation of this freight a large number of cars were for some time held in waiting, to the detriment of private interests.

"For a while there seemed to be an improvement in the situation, but it was of short duration. Several coal operators had succeeded in obtaining a number of cars and made arrangements for resuming work in the mines, when the cars were again withdrawn. These operators are now taking steps to sue the state for damages. It should be said, however, that the Belgium State Railway authorities have closed contracts for a very large number of freight cars from various car building firms in Europe, but how this will relieve the present shortage is difficult to understand."

Under date of Jan. 16 the German Railroad Association's official organ publishes a paper from the beet-sugar manufacturers in Bohemia addressed to the Minister of Railroads, in which they disclaim responsibility for delay in returning empty cars, it having been asserted by the railroad officials that the manufacturers had themselves to blame for the shortage of cars from which they now were suffering. They further claim that the principal cause of the trouble lies in the shortsightedness of the authorities in not providing adequate yard facilities and sufficient equipment to meet emergencies. They also suggest that the cars which they need for beet transport should not in the future be employed in coal traffic or for other purposes during the time they are needed by the sugar industry, and finally they point out that a faster freight schedule would enable the same number of cars to dispose of larger tonnage.

Bessemer Steel in the United States in 1899.

The American Iron and Steel Association has received complete statistics of the Bessemer steel ingots and Bessemer steel rails made in the United States in 1899, except the comparatively small quantity of standard rails and street rails which were made from purchased blooms or were re-rolled from old steel rails:

The total production of Bessemer steel ingots in 1899 was 7,586,354 gross tons, against 6,609,017 tons in 1898, showing an increase in 1899 of 977,337 tons, or over 14 per cent., the largest in our history. It was more than twice the production of 1894, and was almost twice the production of 1896. Of the total production in 1899 3,539 tons were steel castings, against a similar production in 1898 of 3,539 tons. The following table gives the production of Bessemer steel ingots, including direct castings, in the last six years:

Years.	Bessemer	Years.	Bessemer
Gross tons.	ingots.	Gross tons.	ingots.
1894.....	3,571,313	1897.....	5,475,315
1895.....	4,909,128	1898.....	6,609,017
1896.....	3,919,906	1899.....	7,586,354

The following table gives the production of Bessemer steel ingots in the last four years in gross tons:

States—Ingots.	1896.	1897.	1898.	1899.
Pennsylvania.....	2,292,314	3,060,049	3,402,254	3,968,779
Ohio.....	568,535	1,041,541	1,489,115	1,679,237
Illinois.....	780,105	943,774	1,105,040	1,211,246
Other States.....	278,452	429,951	612,608	727,092
Total.....	3,919,906	5,475,315	6,609,017	7,586,354

The production of all kinds of Bessemer steel rails by the producers of Bessemer steel ingots in 1899 was 2,240,767 gross tons, against a similar production in 1898 of 1,955,427 tons and 1,614,399 tons in 1897. The maximum production of Bessemer steel rails by the producers of Bessemer steel ingots was reached in 1899. The year of next largest production was 1887, when 2,044,819 tons were made. The following table shows in gross tons the

conferred with the railroad authorities for the purpose of agreeing upon what improvements will be necessary to avoid such congestions in the switching yards in the future. The conclusion has finally been reached that hereafter coal trains will be made up at and started from the larger mines at which the output is one or more full train loads a day in the same direction, thus reserving the switching yards for cars brought in from the smaller mines for various destinations. Where all the mines in a district are controlled by a syndicate, this arrangement is thought practical without working injury on either operators or consumers.

Concerning the car shortage in Belgium, the "Moniteur des Chemins de Fer" publishes the following: "The hopes of manufacturers and coal operators alike still fail to be realized; the car shortage continues in the same exasperating manner, and has

production by States of Bessemer steel rails by the producers of Bessemer steel ingots in the last four years. The figures given do not include the rails made each year from purchased blooms, or re-rolled rails, statistics for both of which products for 1899 are not yet available:

States—Rails.	1896.	1897.	1898.	1899.
Pennsylvania	663,096	1,024,386	1,052,771	1,224,807
Other States	439,796	590,013	902,656	1,015,960

Total, gross tons. 1,102,892 1,614,399 1,955,427 2,240,767

At the request of the steel rail makers, the Association has separated for 1897, for the first time, the production of Bessemer steel rails weighing 45 lbs. and less than 85 lbs. to the yard from those weighing less than 45 lbs. and over 85 lbs. This separation for 1899 is shown in gross tons as follows:

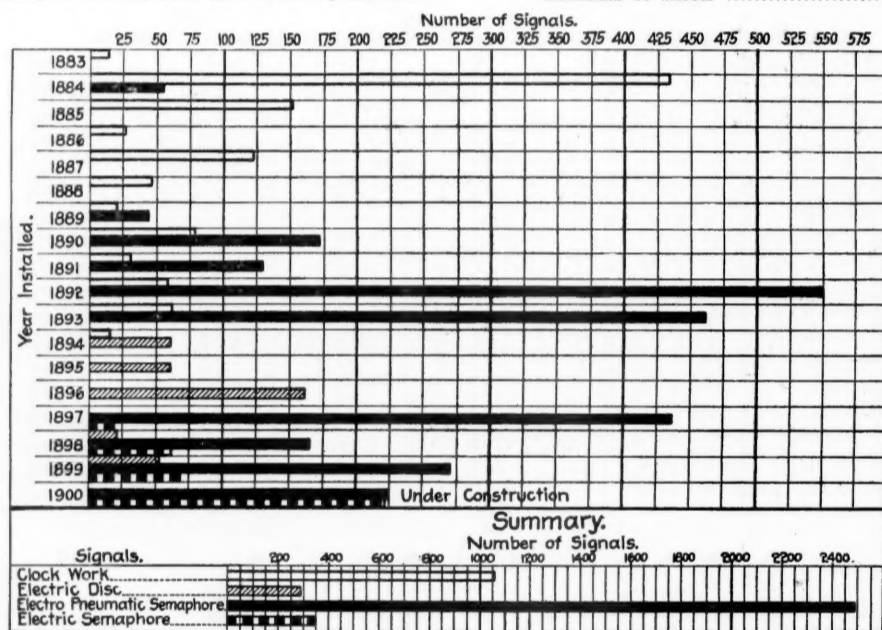
States—Rails.	Under 45 lbs.	45 lbs. and less than 85 lbs.	85 lbs. and over.	Total gr. tons.
Pennsylvania	62,639	835,801	326,367	1,224,807
Other States	67,496	695,307	253,157	1,015,960

Total, gross tons. 130,135 1,531,108 579,524 2,240,767

The total production of rails in 1899 does not include rails made from open-hearth steel and iron rails. When all the figures are obtained it will probably be found that the total production of all kinds of rails in 1899 was about 2,300,000 tons.

Progress in Automatic Signaling.

Our readers will remember that Mr. Edward C. Carter, in his paper on "Automatic Signals," which was published in the Railroad Gazette of January 12, page 18, gave a table showing the number of each kind of signal which had been put up in the United States during the 17 years ending Aug. 1, 1899. Taking this table as a basis, the Union Switch and Signal Company has prepared a diagram showing in graphic form that part of Mr. Carter's statistics which refers to the signals made by that company, and this diagram we show herewith. The total number of signals shown by Mr. Carter's tabulation was 6,496, and, as will be seen by the chart, the Union



Automatic Block Signals Built by the Union Switch & Signal Company

All of them "normal clear" and worked by track circuit.

Company has built about 4,000 of these. A striking feature of the chart is the gradual shortening of the lines representing clockwork signals and the concurrent lengthening of those representing the later forms. As might be supposed, from the extensive installations made by the Pennsylvania Railroad, the electro-pneumatic signal shows a mark more than twice as long as that shown by any other kind. Not the least striking feature of the showing is the rapid advance of the electric semaphore. This, however, is a development which has taken place mostly since Mr. Carter's table was made up, the last line of the chart and a part of the next preceding one being based on orders received since the table was compiled.

The New Ten-Wheelers for the Pennsylvania Lines.

In our issue of January 19 was published an elevation of one of the new ten-wheel passenger locomotives (Class G 4) which are now building at Altoona and the Baldwin Locomotive Works for the Lines of the Pennsylvania System East and West of Pittsburgh. The following is a list of the principal dimensions of the same engines, the dimensions previously given being incomplete. As was said at that time, freight engines are also building which will be identical with the passenger locomotives excepting that the drivers are 62 in. in diameter instead of 72 in.

Type	Ten wheel
Gage	4 ft. 8½ in.
Fuel	Bituminous coal

Weight on drivers	133,000 lbs.
" truck wheels	42,100 lbs.
" total	175,100 lbs.
tender loaded	107,900 lbs.

General Dimensions.	
Wheel base, total, of engine	25 ft. 5 in.
" driving	13 ft. 10 in.
" total (engine and tender)	54 ft. 7½ in.
Length over all, engine	42 ft. 1½ in.
" total, engine and tender	66 ft. 5½ in.
Height, center of boiler above rails	9 ft. 0 in.
of stack	15 ft. 0 in.
Heating surface, firebox	162.43 sq. ft.
" tubes	2,652.20 sq. ft.
" total	2,814.63 sq. ft.
Grate area	30.8 sq. ft.

Wheels and Journals.	
Drivers, diameter	72 in.
" material of centers	cast steel
Journals, driving axle, size: 1st and 2nd 9 x 13 in.; main, 9½ x 13 in.	5½ x 10 in.
" truck	7½ in.
Main crank pin, diameter	7½ in.

Cylinders.	
Cylinders, diameter	22 in.
Piston, stroke	28 in.
" rod, diameter	4 in.
Kind of piston rod packing	Metallic
Main rod, length center to center	10 ft. 1¼ in.
Steam ports, length	20 in.
" width	1½ in.
Exhaust ports, length	20 in.
" width	2½ in.
Bridge, width	1¼ in.

Valves.	
Valves, kind of	Balanced slide
" greatest travel	6 in.
" outside lap	1 in.
" inside lap	Front, 1/16 in.; back, ¼ in.

Boiler.	
Boiler, type of	Belpaire
" working steam pressure	225 lbs.
" material in barrel	Steel
" thickness of material in barrel	7/16 in.
" diameter of barrel	72½ in.
Seams, kind of horizontal	Sextuple riveted butt
" circumferential	Double riveted lap
Thickness of tube sheets	Back, ½ in.; front, ¾ in.
" crown sheet	¾ in.
Crown sheet stayed with	Radial stays
Dome, diameter	30½ in.

Firebox.	
Firebox, length	10 ft. 1¾ in.
" width	4 ft. 1½ in.
" depth front	70½ in.
" back	67½ in.
" material	Steel
" thickness of sheets	5/16 in.

Massachusetts Railroad Commissioners' Report—Street Railroads.

The Massachusetts railroad commissioners have issued their report for year ending Sept. 30, 1899, relating to the street railroads of the State.* The report before us gives returns from 116 street railroad companies, thirteen more than in 1898. Fifteen new companies were organized during the last fiscal year, and of the 116 reporting companies, 81 were working their roads. There were added during the year 162 miles of track, 35 miles of second main track and 3 miles of side track, making a total addition of 200 miles. We have tabulated, below, the totals of the more important items.

	For year ending Sept. 30, 1899.
Miles of track owned	1,846
" operated	1,739
Passengers carried	350,724,213
" per mile track (10 companies)	68.2
Per cent. of operating exp. to gross receipts	41.380,143
Capital stock	29,923,500
Funded debt	11,971,248
Unfunded debt (including outstanding real estate mortgages)	85,191,000
Cost of road and equipment (approximate)	18,151,550
Gross earnings from operation	12,378,488
Operating expenses	5,175,062
Net earnings from operation	1,337,788
Income from other sources	19,519,338
Gross income from all sources	1,622,598
Interest on debt and loans	2,315,398
Dividends	184,544
Surplus for the year	

Railroad Legislation in South Carolina.

The South Carolina Legislature, which recently adjourned, passed two general railroad laws. The first one, No. 117, amends the laws of 1898 requiring separate cars on passenger trains for negroes. As amended, the law requires separate and equal accommodation for the white and black races, but stipulates that after 60 days from the approval of the act there shall be but one rate (three cents a mile) for all passengers, and the railroads shall not be required to run second-class cars or to sell second-class tickets. This law is similar to that in force in Georgia. Roads under 40 miles in length and narrow-gage roads are excepted, and there are the other usual provisos.

Bill No. 136 requires all railroads to have connecting tracks where they enter the same town. Provision is made for taking land where necessary. The Railroad Commissioners may suspend the operation of the law where, after hearing, a track is found unnecessary. There is a penalty of \$25 a day for neglect of the law. Where there is a connection a railroad must transfer freight to other roads for not over \$1 a car, and there is a penalty of \$1 an hour for neglecting to transfer a car. The State Railroad Commissioners are to apportion the expense of making a connecting track.

American Practice in Block Signaling.†

By B. B. ADAMS.

SINGLE TRACK BLOCKING—CONTINUED.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

BLOCK SIGNAL RULES.

On certain divisions of this railway, which will be indicated on the time tables of such divisions, trains will be controlled at stations by a block signal system. This system is not designed to relieve train and enginemen from the fullest observance of all general and special rules, special orders, instructions and bulletins governing the movement and protection of trains. . . .

Instructions to Train and Enginemen.

1. A block signal arm nearly vertical, or white light, signifies signal is clear and train may proceed if its time table rights or special orders permit it to do.

2. The block signals are also used for train orders and all rules applying to train order signals will apply to them.

3. Trains must not pass a block signal at danger except under authority of a clearance card (Form 168) or permissive card (Form 27) which must be obtained from the operator on duty.

4. When the block signal stands at danger, and the operator issues a clearance card which states that he has "no orders" or "no further orders" for the train named, the train receiving the clearance card may proceed if its time table rights or special orders permit it to do so; provided the clearance card does not state that the block signal is at danger for the train holding the clearance card. If the block signal is at danger for the train holding the clearance card, it must have a permissive card in addition before it can proceed. When a train receives a permissive card it must also have a clearance card in addition before it can proceed. Clearance cards are printed in the style shown in Form 168, and when issued as provided by these rules the conductor and engineer must each have a card.

5. A permissive card is used when trains are permitted to pass a block signal at danger and enter a section under notice that the preceding train has not cleared the same section. This is to be used only by direction of the train dispatcher.

6. When a train is to proceed under permissive card the conductor and engineer must each have a card [Form 27] properly filled out and signed by the train dispatcher:

*The report for the steam railroads was printed in our issue of March 2, p. 139.
†Previous articles in this series may be found on pages 4, 34, 84 and 121.

7. Permissive cards will be designated by letter instead of by number. The designating letter, O. K.; time made O. K.; and the train dispatcher's initials must be endorsed on the face of the permissive card and signed by the operator before it becomes effective.
8. At certain block signal stations, which will be indicated by a special rule or bulletin on each division where used, permissive arms painted green, and displaying a green or white light at night, are attached to the signal post below the block arm for the purpose of moving trains permissively.
9. When trains receive a caution signal it indicates that the preceding train has not cleared the section, and that the train may proceed as if moving under a permissive card.
10. Trains moving under the authority of a permissive card or caution signal must run with great care and at reduced speed to insure against collision with train ahead.
11. When approaching stations all trains must be gov-

- vance of the block signal, operators may endorse on clearance cards that their signal will be clear on the arrival of a specified train, as provided on the clearance form. Such an endorsement does not allow the train holding the card to proceed after the arrival of the specified train, unless its time table rights or special orders authorize it to do so. Trains holding such permission must know that the specified train has arrived and see the markers before proceeding.
20. On double tracks, trains will not foul the wrong main track until the conductor and engineer have in their possession written permission from the train dispatcher to do so. This permission must be given on Form 53 "cross over card" with all the blanks properly filled. After such permission is obtained, and the train has been protected in both directions in accordance with the general rules, the train may proceed to occupy the wrong main track.
21. When the train is again on its proper track, entirely clear of the wrong main track, the conductor must

40. After the engine of a train has passed a block signal at clear in the direction in which the train is proceeding, the block signal when placed at danger does not hold the train, and operators must obtain the signature of conductors to train orders which may be received after the arrival of a train, the engine of which has passed the block signal, before replying to the train dispatcher that his signal is out to hold the train.
41. When it is necessary for a train that has passed the block signal to re-enter the section in its rear, the operator will not permit it to do so unless the section is clear, nor until he has blocked trains at the block signal station toward which the train will back.
42. (Markers on rear car and what to do if they are missing.)
43. Operators must keep a correct record of trains, etc.
44. They must promptly report the time of departure of all trains or the clearing of the section, to the block signal stations east and west.
45. They must not report a train clear of the section until they have seen the markers, nor until the last car has passed the signal 300 ft. in the direction in which the train is moving.

46. When a train is on a siding clear of the main track, and the markers have been seen or the conductor reports that all his train is on the siding, the section may be reported clear.
47. When a train is to take siding at their station to be passed by a following train, operators must not report section clear until the train is on the siding clear of the main track and the markers have been seen or the conductor reports that all of his train is on the siding clear of the main track.
48. When trains are to meet at a block signal station, operators will block all trains until the train or trains that are to take the siding have cleared the main track and the markers have been seen or the conductor reports that all his train is on the siding clear of the main track.

FORM 53.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY,
CROSS-OVER CARD.

Div..... Station.....189....
To Conductor and Engineer Train.....
After protecting your train by sending out Flagmen as per General Rules, you may cross to the wrong main track at..... Station. The authority granted by this card is void after.....m. Report your train when clear of the wrong main track as per Block Signal Rule No. 21.

Train Dispatcher.

CARD	MADE	AT	BY	OPERATOR

FORM 168.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.
CLEARANCE CARD.

Station.....189....
To Conductor and Engineer Train.....
I HAVE NO.....ORDERS FOR YOUR TRAIN.
BLOCK SIGNAL IS AT DANGER FOR.....
If Block Signal is at danger for the train holding this Clearance Card, a Permissive Card (Form 27) must be procured before the train can proceed.
When the authority given by Rule No. 19 is used, Operators will fill out the following:
ON ARRIVAL OF TRAIN..... BLOCK SIGNAL WILL BE AT CLEAR.
To comply with Rule No. 13 Operators will fill out the following:
BLOCK SIGNAL IS AT DANGER FOR TRAIN..... AND TRAIN.....TO MEET (OR PASS) AS PER SPECIAL ORDER No.....
This Clearance Card does not interfere with nor countermand any General or Special Rule, Instructions or any Special Orders you may have received from the Train Dispatcher.
Time issued.....m.....Operator.

erned by General Rule No. 66. [This rule requires all trains except regular passenger trains to approach all stations under control. Inside of yard limits the approaching train is wholly responsible for avoiding collisions.]

12. Trains of an inferior class must not occupy the main track in any section when a train of superior class is due to enter the same section at the first block signal station ahead or in the rear.

13. When a train approaches a block signal station and finds the block signal at danger it will indicate that the section is occupied or that there are train orders, and the conductor must hasten to the telegraph office.

14. After the markers of a train have passed a block signal at clear in the direction in which the train is proceeding, and the block signal is afterward placed at danger in accordance with Rule No. 1, it does not hold the train; and a clearance or permissive card is not necessary before the train can proceed.

15. A train having passed a block signal must not back within 300 feet of the signal without first receiving permission from the operator and protecting by flagman as provided in General Rule No. 62.

16. Block signal stations which are closed either during the day or night will be indicated on the time table, or by bulletin.

17. When block signal stations are closed both arms are placed at clear. If closed at night the lamp is left burning. The section is then extended to the next open block signal station. The absence of the light at night must be considered as indicating danger, and trains finding block signal lights out must stop, but may proceed if the conductor and engineer find both block signal arms are at clear. If either of the arms are at danger, trains will not proceed until a clearance card has been obtained from the operator, who must be called for that purpose.

18. Trains must not go to a closed block signal or a non-telegraph station to be met or passed by other trains without special orders from the train dispatcher, copies of which will be given to the operators at the nearest block signal station on each side of the station where trains are to meet or be passed. Operators receiving such orders will keep their signal at danger and issue a clearance card (Form 168) reading:
"Block signal is at danger for train — and train — to meet (or pass) as per special order No. —."

19. At block signal stations where sidings are in ad-

FORM 27.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY CO.
PERMISSIVE CARD.

Station.....189....
Conductor and Engineer No.....
Use Permissive Card from.....
to.....
Train.....is in Section.
This order will be made in triplicate, one copy to be delivered to Engineer, one to Conductor and one filed by Operator.

Train Dispatcher.

CARD	MADE	AT	BY	OPERATOR

write a telegram addressed to the train dispatcher stating "My train is clear of the — bound track. Time — M.," signing his name in full. The writing and signing of this telegram must not be delegated; the conductor must personally write and sign this telegram.

22. In case the telegraph fails the operator is permitted to issue a clearance card (Form 168) stating that the signal is at danger for telegraph failure, providing he has no orders requiring him to hold the train to which the clearance is to be delivered.

23. Trains receiving a telegraph failure clearance may pass the block signal at danger, provided their time table rights or special orders permit them to proceed, or provided a flagman has been sent ahead the distance required by the general rules.

24. Form 53 is the form of the cross-over card referred to in Rule No. 20.

Instructions to Telegraph Operators.

30. The telegraph operator on duty will have charge of block signals, and will be held responsible for their proper handling, in accordance with following instructions:

31. They must keep the signals at danger, except when placed at clear to allow a train to pass, or except during the hours when the block signal is authorized to be closed.

32. They must not permit a train to enter a section following another train until the preceding train has been reported clear of the section, except when the train dispatcher authorizes the use of permissive card or caution signal as per Rules Nos. 49 and 50, or except as provided in Rule No. 57.

33. On single track they must not permit a west-bound train to enter the section, except as provided in Rule No. 57, until they have notified the next block signal station west to block eastbound trains for — train, using signal 47 for that purpose, and have received an acknowledgment as per Rule No. 58.

34. The operator called for signal "47" must not accept it if an eastbound train is in the section, and will notify the operator offering the signal to hold the west-bound train.

35.—Operators must not permit a train to enter a section when a train from the opposite direction has been reported into the section by the next block signal station, except as provided in Rule No. 57.

36. At block signal stations where sidings are in advance of the block signal and a train is awaiting the arrival of an opposing train, operator may hold all other trains, except the expected train at the block signal station in advance, and issue a clearance card, which states that on the arrival of the train specified on the clearance card, the signal may be considered at clear. Operators issuing clearance cards will make three manifold cards. Two cards will be delivered to the conductor and one placed on file for reference.

37. In answering the "47," as per Rule No. 36, the operator at the block signal station in advance must except the train already in the section in the following form: "I. I. B. 47 except No. — for —." Both operators must make full record of this on their train register sheet.

38. When there are no train orders and the section ahead is clear for an approaching train, the block signal should be changed to clear as soon [as], but not before the engineer is in sight of it, that the train may enter without reducing speed.

39. When the block signal has been placed at clear to allow a train to enter the section, it must be placed at danger immediately after the last car, carrying markers, has passed the signal.

49. (Covers same ground as Rules 6 and 7.)

50. At block signal stations where permissive arms are in use the operator must receive authority to use permissive signal in the same manner as at stations where cards are used, and will fill out one card and file for reference.

51. (Covers same ground as Rule 8.)

52. As block signals are also used for train orders, operators must be governed by the general rules relating to train order signals.

53 and 54. (Cover same subject as 4.)

55. (Covers same as 17.)

56. When a block signal station is closed, the block signals must be placed at clear. At night the lamp must be left burning.

a. When a block signal station is re-opened the block signals must be placed at danger immediately, and the block signal stations on each side, and train dispatcher notified. The position of trains must be ascertained and a record of any train in the section made on the train register sheet.

b. The first train arriving after a block signal station is open must not be allowed to pass except by authority of the train dispatcher, who will instruct whether a clear signal or a permissive card is to be given.

c. When a block signal station is closed the block wire will be arranged to work through the closed station and operators on either side will consider the section as extended with no change in the rules governing the operation of the signals.

57. (Covers same as 18.)

58. When it is desired to block trains at stations ahead, or back, for any purpose, the following signals must be used:

"47" block eastbound trains.

"58" block westbound trains.

When this signal is transmitted the operator receiving it will respond: "I. I. B. 47," or B. 58," as the case may be, and sign his initial and office call, and will block such trains until the section is reported clear.

59. When a freight train is inside the outer switches at certain block signal stations which will be indicated by special rule, it may be reported as arrived; provided the operator has seen the markers or has been notified by the conductor that all of his train is inside the switches. Following trains may [then] be given a clear signal, except that if a passenger train is to enter the section it must have a permissive card before it is allowed to proceed. When a passenger train is at a block signal station no train will be permitted to follow until the passenger train has cleared the section, except on special telegraph orders from the train dispatcher.

60. (Covers same as 20.)

61. In case the telegraph fails from any cause, operators will be governed as follows:

a. They may issue a clearance (Form 168) stating that the block signal is at danger for telegraph failure.

b. If they have no report that the preceding train has cleared the section, they must issue a permissive card in addition to the clearance.

c. If they have special orders to hold a train they must hold it indefinitely.

d. If they have orders for delivery to a train they must be governed by General Rule No. 104. [Such an order is void if O. K. has not been received, but must be shown to conductor and engineman.]

Electric Conduit Construction in New York.

In our issue of March 5, 1897, we described the electric conduit construction of the lines of the Metropolitan Street Railway Company of New York and gave editorially some of the determining factors which lead to the adoption of this expensive method.

Few accurate figures of costs could be given at that time, but previous work in New York and in Washington, D. C., made it possible for the company to estimate quite closely the cost of building the road. The success of this system being assured, which means (as noted in our issue of March 9) that all the lines worked by cable of the Metropolitan system are soon to be electrified, it may be of interest to give a few important facts relating to some of the engineering features of this work. For these we are indebted to Mr. W. B. Reed, Engineer Maintenance of Way, Metropolitan Street Railway Company, who

commendable features not possessed by the overhead electric and is to-day probably the only construction which can be safely advocated for operating a street railroad on a large mileage should it be required that the overhead wire be removed.

The Association of Engineering Societies.

The report of the Secretary of the Association of Engineering Societies for the year 1899 shows prosperity remarkable if we overlook the fact that the Association rests upon a sound business principle

more material, and gives to that material a much wider circulation, but also proves itself a more economical and efficient means of publication than any individual society, with relatively small membership, can hope to provide. In round numbers, the cost of publication by the Association is only about one-fourth of that in the three large outstanding societies (Chicago, Pittsburgh and Philadelphia); and one of the four founders of the Association, the Civil Engineers' Club of Cleveland, entirely relieved itself of all charge on account of the Association in 1899 by securing advertisements for the Association



Fig. 1.—Location of the Eleven Associated Engineering Societies.

Each dot represents 100 members or fraction of 100. The aggregate membership is 1,475.

prepared a paper for the last meeting of the New York Railroad Club, but which was not read for want of time.

Each mile of single track requires about 670 tons of steel and iron, which is equivalent to using a 420-lb. rail on a steam road. About 3,000 cu. yds. of concrete, besides a large amount of copper cables, are required for each mile of track. The cast iron yokes weigh from 430 to 640 lbs. each, and in place of ballast, Portland cement concrete is used. The entire width of the roadbed (where a double track line is being laid) is dug 18 to 20 in. and after the yokes are in place and the tram rails and slot rails fastened to them, the structure is put approximately to line and surfaced, being blocked up between the ties. Every third yoke is a box yoke shaped to receive the insulators. These are 15 ft. apart, but the other yokes, which are used only to support the tram and slot rails, are five feet apart. Concrete is then tamped under the base of the yokes, in much the same way as ballast is tamped under railroad ties. This method of construction has been criticised by a prominent steam railroad engineer, who claims that it would be better to build the foundation before putting up the structure. In answer to this, Mr. Reed says that they have used the method universally adopted on steam railroads and find it much easier to get the track to the proper surface in this way than to build the foundation first.

The mould for the conduits, made of steel sheets properly shaped and so arranged that they can be easily removed after the concrete is set, is then put in place. The concrete is then put in and allowed to set. This explains in the rough how the work is done, but it may be surmised that there are many difficulties to overcome, especially where city pipes have to be lowered or removed. The method of connecting the feeders, the design of the plover and the different apparatus which takes the current from the positive conductor rail to the car and in turn leads the current from the car to the negative rail, and other details of construction we must assume are all familiar to the reader. It may be said that this construction is practically the same as that used on the Third Avenue Railroad, but the yokes used on the latter railroad, instead of being all cast iron, are built up with an I-beam base to which cast iron forming the sides of the conduit and supports for the rails are riveted. The Third Avenue Railroad built the foundation for yokes before setting them in place. Instead of bolting the tram rails directly to the yokes, a stringer of 5 x 5 in. creosoted timber is put under the rails to give them some elasticity. Cast welded joints have been used on this road. The system used in Washington, D. C., is practically the same as used in New York.

The expense of building a straight track in New York has been as high as \$150,000 a mile of single track on the Metropolitan roads, and at some of the intersections, where special turnouts, crossings, etc., were put in, it was much more than this. At the intersection of Sixth Ave. and Twenty-third St. the cost was \$59,653; at Canal St. and West Broadway, \$48,869; and a simple square crossing (two tracks by two tracks) at Grand St. and West Broadway cost \$21,587. The special work at Thirty-fourth St., East River, cost \$95,333. Thus it will be seen that while the lines of the Metropolitan Street Railway Company are to-day in successful operation, the cost has been so high as to lead railroad companies in other cities to weigh carefully the serious objections to the introduction of the conduit electric construction, notwithstanding the fact that it has

—that of combination and concentration of effort for a single purpose—viz., the proper and economical publication of the papers and proceedings of the several societies composing it. The principal features of the report are set forth in four diagrams, of which we reproduce three—viz.:

Fig. 1. A skeleton map of the United States, showing the locations and approximate memberships of the eleven societies composing the Association; Fig. 2. Diagram of cost of Journal per member and of annual assessment, 1894 to 1899, inclusive; Fig. 3. Comparison of conditions between the Association of Engineering Societies and three large societies not members.

The aggregate membership of the societies composing the Association, which increased from 1,174 to 1,477 during 1895, and was then reduced to 1,106 by the withdrawal of the Western Society of Engineers, has since steadily increased again, until at the close of 1899 it had practically made good the loss so caused. The geographical limits of the Association now extend from the Atlantic to the Pacific, and from Montana and the Great Lakes to the Gulf of Mexico.

Notwithstanding a steady decrease in the annual assessment upon the members, the net assets of the Association increased from a deficit of \$759 at

MEMBERSHIP.

Association	1475
Chicago	432
Pittsburg	363
Philadelphia	436

Pages in Journal.

Association	958
Chicago	822
Pittsburg	436
Philadelphia	424

ANNUAL COST

Per member per 1000 pages.

Gross,	
Association	\$1.80
Chicago	6.57
Pittsburg	5.23
Philadelphia	7.31
Gross, less sales.	
Association	\$1.06
Chicago	5.38
Pittsburg	4.63
Philadelphia	6.84
Net	
Association	\$0.61
Cleveland	0.00
Chicago	0.55
Pittsburg	4.13
Philadelphia	3.23

Fig. 3.—The Membership of Various Engineering Societies and the Cost of their Publications.

the end of 1894 to a surplus of \$2,937 at the end of 1898, when a rebate of \$1 was made from the assessment of \$2 for the express purpose of reducing the surplus, with the result that the surplus, which would otherwise have reached \$3,843 by the end of 1899, was reduced to \$2,443; for, "the object of the Association is not to accumulate a large and nearly idle surplus, but to give to its members the best possible service at the least possible cost."

The gross cost per annum per member declined from \$4.92 in 1894 to \$2.19 in 1899, while the annual assessment per member, which was increased from \$3 to \$3.66 in 1895, was reduced to \$2 in 1898 and (by a rebate of \$1) virtually to \$1 in 1899. The Association, by virtue of its much greater membership, not only provides the members of its societies with

Journal. The Association not only gives much better service than individual societies, but gives it much cheaper.

The Delagoa Bay Railroad.

Within a day or two an announcement has come from Berne, Switzerland, to the effect that the tribunal appointed to arbitrate in the Delagoa Bay matter has rendered judgment on the principal points in that famous and tedious case. The New York Sun has secured a statement of the main facts in the case from a correspondent in Geneva, N. Y. (not Switzerland), which we reprint as being of particular interest at this moment. From internal evidence we guess that the Sun's statement comes from Mr. F. C. Penfield, lately U. S. Consul-General at Cairo, who married the widow of Colonel McMurdo, and who, of course, has minute knowledge of the history of this case.

This case was referred through the President of Switzerland to three Swiss jurists by the United States, England and Portugal about ten years ago.

The events which led up to the arbitration proceedings date from December, 1883, when Col. Edward McMurdo, a Kentuckian, received from the King of Portugal an unconditional exclusive concession for a railroad from Lorenzo Marques to the Transvaal frontier. This concession granted to the concessionaire large tracts of land along the proposed route, a large tract of land upon much of which the town of Lorenzo Marques now stands, an island in Delagoa Bay, and certain privileges along the water front. Col. McMurdo enlisted the aid of British capital in the construction of the road. It was completed in November, 1887, to what the Portuguese engineers at that time certified was the Transvaal frontier. They certified that it was the point to which the road was to be constructed.

In 1889 the Portuguese Government served notice on Col. McMurdo that the true frontier was six miles further inland; that if the road was not constructed to the new frontier within four months the concession would be cancelled and the road would be seized by the Portuguese Government. Col. McMurdo replied that although it would be practically impossible to complete the extension within the time specified he was willing to extend it if sufficient time were allowed. The road was seized by Portugal in June, 1889. Secretary Blaine, in behalf of the McMurdo interests, co-operated with Lord Salisbury to compel Portugal to make proper reparation. Portugal pleaded that because of her weakness she should not be

forced. She admitted that the act of seizure was unwarranted. She admitted her responsibility in the matter and paid a considerable sum on account.

The arbitration tribunal to adjudicate the claim against Portugal and fix the indemnity was organized at Berne in 1890. Col. McMurdo died in 1889. His estate was represented by his widow, Mrs. McMurdo, now the wife of Frederic C. Penfield, former United States Consul-General and diplomatic agent at Cairo, Egypt.

Before the case was presented a convention was entered into by Portugal, England and the United States, in which Portugal agreed that she should not dispose of the Delagoa Bay Railroad, its rolling stock, its permanent way or any of the lands granted to Col. McMurdo until final judgment in the case had been rendered and indemnity paid. As the concession covers most, if not all of the water front privileges of Delagoa

Bay and most of the land around the bay, the convention has blocked the sale or concession of Delagoa Bay by Portugal to England or any other power.

Decision has been rendered on the principal points only. The judgment is to the effect that the charge by Portugal of technical breach of contract by Col. McMurdo was without foundation, as the frontier between Portuguese East Africa and the Transvaal was not delimited until two years after the road was seized; that the seizure of the road by Portugal was unwarranted and without just grounds, and that proper indemnity is due the concessionaire and the stockholders of the road, their heirs or assigns. The Swiss Bund has announced that judgment as to the amount of indemnity to be paid by Portugal would be decided at an early date.

When the arbitration proceedings opened, Portugal contended that she ought to pay an indemnity not greater than the amount expended in building the road, about \$4,000,000. The English and American claimants contended that as they built for the future they should be recompensed accordingly. The arbitration tribunal sent a board of engineers to Lorenzo Marques to report upon the value of the concession. The board reported that on December 31, 1896, the concession was worth \$9,000,000. Unofficial experts have estimated its value at from \$15,000,000 to \$30,000,000. When the amount of indemnity to be paid by Portugal is finally decided upon the judgment will be officially communicated to the Governments concerned.

Electrical Engineering on the Brooklyn Heights Railroad.

Under the above title, we gave in our issue of Feb. 23 an account of some interesting engineering work on the Brooklyn Heights Railroad, dealing for the most part with the method of keeping up the voltage on some of the "excursion" lines running out of Brooklyn. There are other matters in connection with the building of the power houses for this railroad, which may now be given, together with a more complete account of the method of keeping up the line voltage on the Sea Beach Railway. For this information we are indebted to Mr. R. L. Russell, Assistant Engineer of the road.

The Brooklyn Heights Railroad Company now controls 447.8 miles of surface roads and 67.3 miles of elevated railroads, a total of 515.3 miles. The first electric line of the company ran from 39th St. ferry to Bensonhurst, 4.7 miles, and was opened on May 26, 1891. The power was generated at a temporary plant at 52nd St. This plant was a typical one of that period, having high-speed engines and small belt-driven generators.

Preparations were made in 1892 for the electrical equipment of the entire lines, but it was not until Jan. 14, 1893, that the permanent station at 52nd St. was ready to start. This station was considered at that time fully up to date, and rather in advance of any plant then in operation. It has a coal conveyor of 60 tons an hour capacity, with storage

making the total capacity of this station 6,700 k. w.

The Eastern power station was partly equipped and first ready for operation Dec. 2, 1893. This plant was the first to use direct-connected generators of large sizes. These had an output of 1,200 k. w. This station was designed to be of 12,000 h. p. capacity, divided into direct-connected units of 2,000 h. p. each. Four of these were put in service in 1893, and the others in the spring of 1898. This station, situated on the East River, has a coal storage capacity of 7,000 tons, and the coal handling plant has a capacity of 70 tons an hour. The boiler room is double deck, provided with 34 Babcock & Wilcox boilers, with a total output of 8,500 h. p. The four original generators were G. E., of 1,500 k. w. each, direct-connected to 2,000 h. p. Reynolds-Corliss cross-compound engines; in 1898 two Walker generators at 1,600 k. w. each, direct-connected to engines similar to the first four, were added.

In addition to these stations, there have been built the one at Wyckoff Ave. and Madison St., a second at First St. and Third Ave., and a third at the foot of 39th St. The equipment in these has been added to as the station loads have become heavier.

certain hours to run at full capacity or on a heavy overload.

The problem to determine the most economical method of operating these plants under very heavy loads for a few weeks was satisfactorily solved by using boosters at the power stations. In distributing the load on the Sea Beach line a radical departure was made from established methods of figuring the

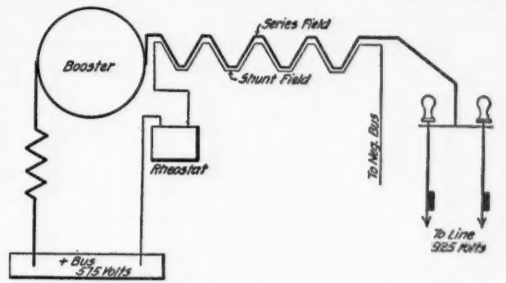


Fig. 3.—Booster Connections on the Sea Beach Line.

necessary copper for feeders. The carrying capacity was the only thing considered in the arrangement. It was estimated that 1,900 amperes would be very near the average maximum on the line, and, as a matter of fact, readings showed that on the day of heaviest travel the greatest load during the maximum hour was 2,060 amperes, about 8 per cent. increase over the original estimate. The feeder problem was the first to be met and solved. To keep the uniform voltage on this road, so that a high speed schedule could be maintained, two boosters (connected as in Fig. 3), designed especially for the work, were direct-connected to comparatively inexpensive engines. These boosters were so designed that it was possible to obtain at the positive terminal of the booster any desired increase of pressure from 25 to 400 volts above that of the power station. The boosters were so wound that they would be in a measure self-regulating, but contained also shunt field coils, which could be easily adjusted to take up the fixed current of the system, and divide proportionately the load between the two machines and the feeders, which were direct-connected on the station bus. The beginning of the line was a little over three-quarters of a mile from the station, and so a certain portion of the road could be easily operated without raising the voltage. Each of the two boosters were "cut in" at two points, as shown in Fig. 2, and these four wires and the direct-feed wire were connected by an equalizing wire. That is, the feed for this section of 12 miles of trolley wire was supplied from the station bus at 575 volts, and from two independent boosters of different voltage. This line, running in multiple, operates with entire satisfaction, the average voltage of the line during its heaviest hours running from 486 to 510 volts. The dotted line wire in Fig. 2 is 0000 wire, with an area of 211,600 c. m. The full line wire is 500,000 c. m.

The Sea Beach line was formerly a steam road carrying as a maximum 55,000 passengers a day, while now, with electricity, the road carries 105,000 as a maximum. It is 29,700 ft. in length, and the time one way by steam was 15 minutes, while with trolley it is five minutes more than this. The approximate positions of the steam trains and of the electric cars as now run on the road is shown respectively by the dots and by the longer black lines along the route of the road, in Fig. 2.

Railroad Employees in Switzerland.

The Swiss Parliament has been engaged in legislating in preparation for the working of the railroads by the State, which will begin in 1903. One house of the Parliament has passed a bill regulating the time of service of employees as follows: All must have 52 days yearly off duty, and of these at least 17 must be Sundays. The holidays must terminate with a night's rest, to be passed at the employee's residence. Enginemen and trainmen of the main line, and station men at important stations of such lines, after five years' service are moreover to have a right to a vacation of eight days. The other employees may require that eight days of their 52 free days be consecutive, and there shall be no deduction from the pay on this account. In case the holidays cannot be spent at home, the management must provide suitable lodgings for the men.

On Sundays and the other general holidays of the year, namely, New Year's, Good Friday, Ascension Day and Christmas, all freight service is forbidden, except express and live-stock. The several cantons may fix four other holidays in the year when ordinary freight shall be neither received or delivered.

Locomotive and train men, including men engaged in making up trains and switching, at important main line stations, may not be on duty more than 14 hours out of 24, women gate tenders 12 hours, and other employees 16. Aside from regular night watchmen, no employee shall have night duty more than 14 hours in any one month. Service between 11 p. m. and 4 a. m. shall be credited as 25 per cent. more than the actual time served.

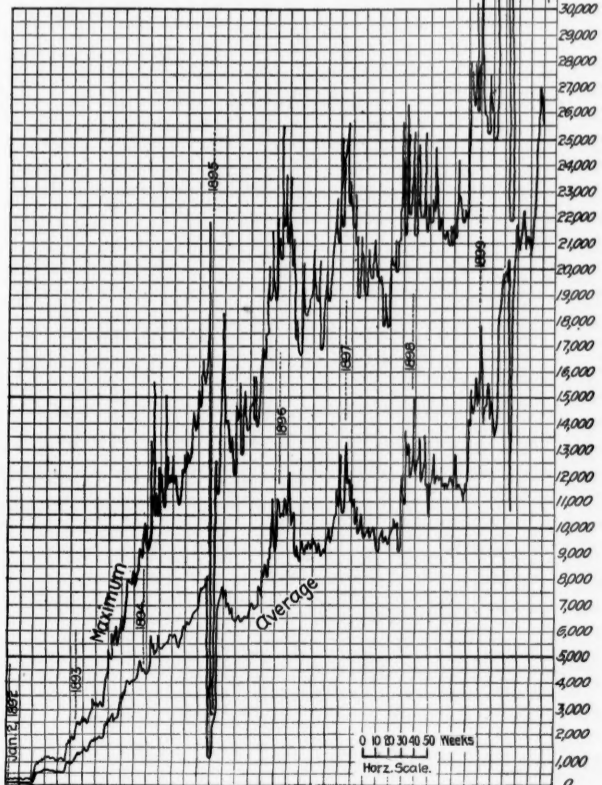


Fig. 1.—Average and Maximum Current Output on Brooklyn Heights Railroad—1892 to 1900.

room for 5,000 tons of coal. There are 16 Babcock & Wilcox 250 h. p. boilers, with a total rated horse power of 4,000. There are 14 "12 G. E." multipolar 500 k. w. generators, in pairs, each pair belted to an Allis horizontal cross-compound engine of 1,000 h. p. and two G. E. 350 k. w. machines used as boosters, one direct-connected and the other belt-connected to a Westinghouse vertical compound 500 h. p. engine,

In Fig. 1 is given a continuous record of the average and maximum ampere-hour output from all of the power stations of the Brooklyn Heights Railroad. The great drops in the current output in 1895 and in 1899 were because of the strikes in those years. This diagram shows that the maximum ampere output is approximately twice the average, and this means, of course, that the stations are required at

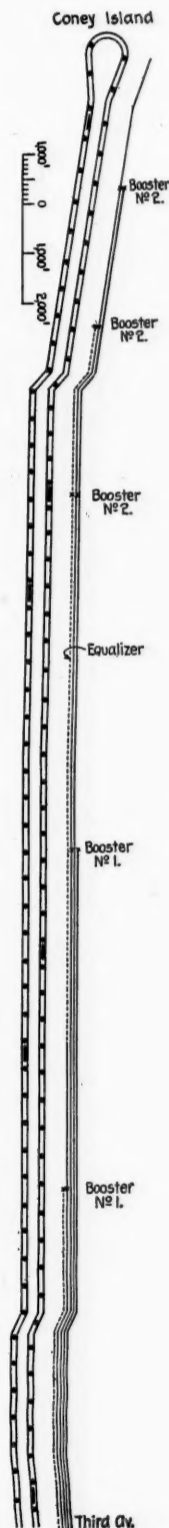


Fig. 2.—Sea Beach Line.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to improvements. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.

In Mr. McHenry's discussion of economical freight train speeds, in our issue of March 2, it was said that in general no particular speed can be fixed as economical in itself, as freight train speeds above 35 miles an hour may be highly economical in one case while in another a very low speed may be demanded. That there shall be no misunderstanding, it may be said that this statement was hardly intended to apply to average schedule speed over an entire division, but under some circumstances it would hold good. Such results, however, would only be reached with undulating grades of high grade. A short train on such grades would fully tax engine adhesion at the top of each grade, while the average resistance over the whole division would not differ appreciably from that of a level grade; hence the available horsepower per ton and consequently the speed would be very much greater than in the case of an engine fully loaded with a long train on low grades.

Leonard's Railway News of March 10 reports that the presidents of the Trunk Line railroads went to Washington last Friday for a conference with the Interstate Commerce Commission. Mr. Cassatt of the Pennsylvania and Mr. Cowen of the Baltimore & Ohio were the only prominent absentees. The report of the conference, while very guarded and vague in its language, states that the results were "reassuring." In the same paper, however, Mr. Leonard reports an interview with Chairman Knapp, which represents the Chairman as feeling anything but reassured. He is quoted as saying (on the day of the conference, and presumably after it ended):

"I can see no marked improvement in the general railroad situation which would warrant changing my view on the subject. The outlook is not bright, by any means, and there is little or no encouragement in the efforts now making to improve the situation. In other words, the tendency among railroads to reduce their rates beyond all reason in their efforts to secure business is so pronounced that it gives very little hope of improvement in the future. I do not think that the outlook can be said to be encouraging for the railroads. The root of the trouble is the lack of legislation. I consider that the inclusion of the railroads among those coming under the anti-trust act as the worst blow the commercial interests of the country have ever received. The railroads must have the right to pool their business, and if they don't secure this the process of consolidation and discrimination will go on. We are now suffering from the effects of unbridled competition, and no matter what temporary efforts to improve matters may be made, the results will not be permanent. It is only a question of time. Why this demoralization in rates should prevail is difficult to even imagine. With more tonnage than they can handle, the roads are taking it for next to nothing, simply because they have reduced the cost of operation down to a minimum. But there will be bad times and small tonnage, and will the solvency of these properties be preserved? As to the financial interests intervening, that is a feature yet to be illustrated and demonstrated. I have read the reply sent by Mr. J. Pierpont Morgan to the Chicago shippers, and it does not mean very much. It is an evasive reply, full of pleasing generalities, but it offers no relief. Whether the financial interests will assist in preventing demoralization in rates is questionable. That

they can if they want to is beyond question, but whether they believe that they will lose revenue in so doing is the important point. Theoretically, at least, they control the situation, but actually will they?"

We are glad to see that Chairman Knapp is unequivocal in his denunciation of the anti-trust law. We cannot think of anything better that can be done just now, for the benefit of the commercial interests referred to by Mr. Knapp, than for him to lay his views before the appropriate Congressional committees, with a view to showing the members the need of repealing the Sherman law, so far as it affects railroads. Probably this is an individual, not an official, duty, for the other members of the Commission may not agree with him as to what should be done; and, even if they did, the Commission as a whole appears to hold the opinion that the anti-trust law is wholly outside its province; but the agitation ought to be begun, in the interest of the public welfare, and who can work more effectively in this direction than Judge Knapp? He has the confidence of a large section of Congress and he is perfectly familiar with the situation. With the Sherman law out of the way, the campaign for the modification of the Interstate Commerce law could be prosecuted without the hampering complications which now beset it. Even if this campaign should lead to no useful result, the railroads would have no great hindrance in the law, except the fifth section; and that is not the worst thing in the world. It is even said that some railroads are not anxious to have it repealed, believing that the right to pool earnings (or such right as would exist under the common law) would not help matters much. Organizations like the late Joint Traffic Association could be maintained, for such bodies would not be repugnant to the law. It is true that the J. T. A. disappointed some of its friends, for it had at least three broken driving-wheel tires almost all of the time during its short life; but its one great principle—frequent and regular conferences of the high-level officers of all the large roads—is still a vital principle in the rational conduct of competitive traffic questions, and the right to lawfully employ this principle is a right well worth fighting for.

It is this principle that President Cassatt of the Pennsylvania seeks to employ when he takes measures to have officers of his road become members of the boards of directors of two railroads which compete with the Pennsylvania. With such an arrangement it is possible, fortunately, to have practical agreement between rival railroads without transgressing the anti-trust law. The man who is a director in each of two rival railroads need not agree or "conspire" with any one but himself, while yet he can exercise such a voice in the counsels of each board as to cause both to pursue the same policy. It is still a question how large an interest or how many or how strong men must be thus connected to produce the desired result. At this writing, rate cutting at Chicago is reported as worse than ever, so that it is plain that the Pennsylvania has not as yet accomplished its purpose of securing stable rates and stopping unjust discriminations. It is not to be expected, of course, that one or two directors in a company of a dozen will be able to change the policy of a railroad company at a single stroke, and it will be necessary to wait a while and see. Mr. Cassatt's words are hopeful and confident; but how confident, no one can tell, for he says that to settle the complicated and troublesome problems involved in dealing with traffic questions covering so vast a territory, and affecting so many diversified interests, "earnest and united effort" must be put forth. To insure earnestness and unity of purpose he has acquired an interest in "some" of the railroads reaching the seaboard. (See Railroad Gazette, March 9, p. 156.) Possibly a larger interest, and interest in more than two companies will be necessary to effect an improvement.

In the meantime, why does not the Interstate Commerce Commission find out and publish some facts about the illegal rate cutting that is said to be going on every day at Chicago and St. Louis? Can it be that hundreds of shippers are getting secret prices and yet that no legal evidence can be procured of a single transaction? Even if there is not a very good prospect of convicting anybody, why should not Mr. Knapp try a few prosecutions? If the evidence of the granting of discriminating rates is strong enough to convince the public it would be a good thing to have it officially published, without regard to whether it would stand the test of the legal technicalities that jurymen have to be bound by. We regret to see that the latter part of Mr.

Knapp's interview is devoted largely to the possible danger of future insolvency. It seems to us that from his standpoint this should be a secondary issue. The main point with him should be publicity and equality of rates. If the railroads reduce rates to too low a point, that is an evil which we may attribute to the multiplicity of railroads, and one which might not be cured for many years, even if we had a perfect Interstate Commerce law. As long as we have ten railroads competing for export business that could be carried by five—and this is a matter for which the States and not Congress are largely responsible—very low rates are sure to prevail. But the immediate question for the Federal authority is, Are these rates open, uniform and stable? This simple question must be settled before rate regulation of any kind can be carried out. The question why rates are now more persistently reduced than they ever were before is answered by Mr. Knapp himself. The cost of carrying has been reduced beyond anything ever before known. And it is noticeable that the more recent of the improvements which have reduced cost have been availed of not only by the oldest and strongest roads, but as well by those roads which have been looked upon as the superfluous or roundabout lines. Rate wars can no longer be settled by the strong lines eating up the weak ones; for they are all strong. It is a contest of giants.

Low Passenger Fares in Germany.

A striking instance of the effect of very low passenger fares on traffic is shown in a curious way in Germany, where, as a rule, no considerable changes in fares have been made for a long time. But not long ago an arrangement was made by which the Prussian State Railroad administration undertook the operation of the State Railroads of Hesse, the latter being a small system with necessarily close relations with the Prussian system. Now Prussia has four classes of passengers; Hesse, like all South Germany, had had only three. Beginning with October, 1898, fourth-class cars began to run on the Hessian lines. They seem to have supplied a long felt want; for in the first year, out of 8,445,607 passenger journeys on the Hessian lines, no less than 4,771,701 were made on fourth-class tickets, and of the aggregate movement, 96,127,700 passenger miles, 61 per cent. was fourth class.

The effect on the other classes was naturally greatest on the third, which decreased nearly one-half; but there was also a decrease of one-seventh in the movement of second-class passengers, who probably found the third class more acceptable after the poorest passengers had evacuated it for the new fourth class. The first-class movement increased 13 per cent., but was yet a mere trifle—only three-fifths of one per cent. of the whole. With all this immense new fourth-class travel, the total passenger movement increased 15 per cent.

The effect on earnings is equally notable. The fourth class, which made 61 per cent. of the total travel, yielded only 38 per cent. of the passenger earnings; and the earnings from the three other classes decreased more than one-third. This left a total increase of 7 per cent. in all passenger earnings, which is less than the ordinary increase from year to year had been under the old tariff, and was, perhaps, not greater than the increase in expenses due to the larger traffic and greater complication. (In amount it was less than \$65,000.) A change in the rules concerning free baggage, made at the same time, resulted in a decrease of one-third in the earnings from baggage; and if we take this into account, the increase in passenger-train earnings was 5 per cent. and not 7; but it is not probable that this change in baggage rates had much effect on the travel.

The regular rates of the Prussian State Railroads (and most other German railroads) are 2, 4, 6 and 8 pfennige per kilometer for the four classes respectively. It might appear from this that the introduction of the fourth class gave the people who were most anxious to save, an opportunity to reduce their travelling expenses one-half; but, practically, the difference is not nearly so great; for much the larger part of the travel is on round-trip tickets, which cost much less than the single-ticket rate; and fourth-class round-trip tickets are not sold. Actually, the average receipts per passenger kilometer in this first year of the fourth class was 3.20 pfennige for the third class, against 2 for the fourth—1.228 cents per mile against 0.786. Even this exaggerates the advantage of riding fourth class; for the average receipt on round-trip tickets for third-class passengers was only 3 pfennige per kilometer, and not 3.20. Now the fourth-class travel can nearly all use round-

trip tickets (there is no fourth class on express trains), so that we may say that nearly the whole of the great fourth-class business was developed by a reduction of one-third in the lowest cost of tickets—from 1.15 cents to 0.786 cent per passenger mile. The average fourth-class journey was only 10½ miles, and its cost about 8 cents. The whole system, however, is a small one, and the average first-class journey was only 26½ miles.

The average fourth-class journey, which cost 8 cents, would have cost 12 cents at third-class return-ticket rates; and it is practically this difference which has attracted more than three-fifths of all the travel in a prosperous German state in a very prosperous year, and about doubled the normal rate of growth of travel. This is the chief lesson of the experiment so far as traffic is concerned. The profits were doubtless less than if there had been no change, as the additional traffic, involving an additional class of cars, must have cost something, and the increase in gross earnings was only at the usual rate.

Ten Years' Improvements in French Railroad Service.

The results of the change in passenger rates on the French railroads have been so affected by the reduction of the Government tax on tickets that the effect of the reduction in the rates received by the railroads themselves is likely to be exaggerated. This Government tax was (by successive increases) 23.2 per cent. of the rate charged by the railroads. In 1892 it was reduced to 12 per cent. by a contract with the companies which bound them to reduce third-class fares 20 per cent. and second-class fares 10 per cent. As time has passed the issue of commutation, tourist and other tickets at reduced rates has increased also, the aggregate result of which is that the average rate per passenger-mile received by the railroads decreased 18 per cent. in the ten years from 1888 to 1898; while the average rate paid by the passenger (including the Government tax) decreased from 1.79 to 1.29 cents per mile. It is thus an average reduction of 28 per cent. which must be considered when accounting for the growth of traffic.

In these ten years there has been a revolution in the speed of express trains. These trains carry but a fraction of the total travel; but it is they which give the general reputation for speed in France, as in other countries; as here, for example, where a few trains approximating 60 miles an hour lead us to forget the thousands which average 30 miles or less. In France, however, really great speeds were practically unknown until quite recently, while now most of the great companies have expresses which compare favorably with English express trains. Moreover, the number of express trains has increased nearly one-half within the past ten years. The starting times from the great terminals have been made more convenient. For instance, the only day express from Paris to Marseilles for many years left Paris about 5 o'clock in the morning, and thousands of American travelers preserve a realizing sense of the miseries involved in such an early start, especially in winter. Now the morning expresses usually leave Paris between 8 and 10 o'clock; and the night expresses between 9 and 10 o'clock; if earlier there is usually a dining car in the train. There were but 10 such cars running in France in 1888; now there are 74, while the number of sleeping cars has increased from 24 to 114—aside from the cars of the International Sleeping Car Co. These are among the improvements in passenger travel since their last World's Fair of which the French railroads boast.

The most notable development in freight traffic meanwhile has been in express goods, the rates on which were revolutionized and greatly reduced at the same time with the passenger rates in 1892. The increase in this traffic since 1891 has been no less than 64 per cent. For other freight the various changes in the rates and in the traffic have resulted in an average receipt of 1.373 cents per ton-mile in 1898, which is 14 per cent. less than in 1888. It may be noted that in the same time the average reduction on the German railroads was 6½ per cent., but this leaves the French average rate about 6 per cent. higher than the German. This comparison, however, is of two very different things. Germany has a vast coal and iron industry, which has been growing rapidly; and it is probable that in any classification the freight of France would average higher than that of Germany. The existence and effectiveness of competing water routes, and many other circumstances, must be taken into account, however, in any such comparison. In both countries the railroads seem to have served the public interests well, as both have been prosperous, though not always in the same way; while the fact that France has a stationary population while Germany grows fast makes a considerable difference in their requirements.

The British Board of Trade has issued a report containing the correspondence between the Board

and the railroad companies concerning the improvement of the means used on passenger trains for enabling passengers to promptly communicate with the guard or with the engineman. The investigation of this subject by the Board of Trade was noticed in the Railroad Gazette of July 15, 1898. The facts shown by the present circular may be summed up in the statement that practically all of the large roads except the four named below have adopted, or intend to adopt, the method of communicating by a partial application of the compressed air or vacuum brake, suitable apparatus being provided in each passenger compartment to enable this to be done. A number of small companies tell the Board that, in view of the shortness of the trips made by their passenger trains, it is not deemed necessary to provide any method of communication. The Metropolitan (underground) of London is awaiting the results of experiments made by the other companies, and the Metropolitan District thinks that in view of the fact that the runs of its trains from one station to another average only about half a mile and that speeds rarely exceed 20 miles an hour, the company ought to be exempted from any obligation. The London, Brighton & South Coast has an electrical apparatus on all of its passenger cars, and this apparatus has been in use 30 years, during which time it has been used 1,306 times, with no record of having failed to act when required. In this system there are two wires running through the train, with a bell pull in each compartment; there is a battery as well as a bell in each guard's van, and also on the engine. The guards can communicate with each other and with the engineman by means of a code of signals. A car can be dropped off from the rear of the train without disturbing the electric apparatus on either the detached portion or the front part, and it is also possible to arrange for an alarm to be given when a train breaks in two. The cost of fitting up a train of 40 compartments is \$325. The South Eastern & Chatham & Dover also uses an electrical communication.

The account printed elsewhere in this issue describing the method adopted for keeping up the line voltage on the Sea Beach road of the Brooklyn Heights Company contains a suggestion for the solution of a hard problem which has to be solved in one way or another on many electric roads. To keep the uniform voltage on the road during the few weeks of very heavy excursion traffic, four booster feeders were run out from the nearest power station and current was supplied to these four wires from two boosters independently connected and supplying current to the lines at 925 volts, which was reduced by the time it reached the feeders to the working voltage of the line. These boosters were made out of old dynamos by simply adding a shunt field. One end of the shunt field wire was led through a rheostat before it was attached to the positive bus, while the other end led to the negative bus. This arrangement, it will be understood, made it possible by changing the resistances to send any desired amount of current through the booster feeder, thus keeping the line pressure at the desired voltage. The attendant watches the ammeter and when he finds it reading zero, he knows that the booster is doing too much work and so more resistance is thrown in. It should be added that the two boosters were "cut in" at two points and the four wires and the direct feed wire were connected by an equalizing wire. We believe this is the first time the problem of the economical use of feeders has been met and satisfactorily solved in just this way.

NEW PUBLICATIONS.

Kinematics of Machinery: A brief treatise on constrained motions of Machine Elements. By John H. Barr, M. S., M. M. E., Professor of Machine Design, Sibley College, Cornell University; Member of the American Society of Mechanical Engineers. New York: John Wiley & Sons. London: Chapman & Hall, Limited, 1899. 8vo, 247 pages and 213 engravings, \$2.50.

This treatise should be in the hands of everyone interested in mechanical movements. The author modestly disclaims pretension to originality or exhaustive treatment; yet he has in a small compass presented a great variety of matter of interest not only to the student of mechanical engineering, but also to the practical mechanic. The subject-matter is most judiciously arranged and discussed in a lucid and attractive manner. Moreover, the numerous illustrations are remarkably clear and well executed. This is a feature of no small importance, not only as adding to the beauty of the book, but as facilitating the mastery of its contents, of which anyone may convince himself by comparing this work with Willis's "Principles of Mechanism."

The first chapter, which treats of conceptions of motion and the nature of a machine, is very full and instructive. In touching upon the graphic representation of motion, resolution, composition, etc., the familiar "parallelogram" of course receives due notice, but it is not indicated that this construction applies only to a free point; and it is to be regretted that the author does not allude to certain cases of constrained motion, in which the diag-

onal of that parallelogram does not determine, in magnitude or in direction, the true resultant of two given components.

But he atones for this omission in the second chapter (on the transmission of motion), by a very clear and simple argument on the "condition of positive driving," in the case of two pieces turning in contact about fixed parallel axes, a point heretofore obscured by a sort of haze, which our author has successfully dispelled. This chapter also contains a very brief but suggestive explanation of "the inversion of mechanisms"; and in addition it treats of a topic too much neglected (that of the relative motions of the different members of a mechanical combination), in a manner to make the reader wish that more illustrative examples had been given. The pleasure of reading this portion of the work, however, is interfered with by a persistent oversight on the part of the proof-reader, through which such expressions as "the body A moves relative to B," and the like, offensive to the physical eye and the mental ear, recur with exasperating frequency. But the discussion of instantaneous axes and their loci is, considering its brevity, very comprehensive; and the alert reader will not fail to appreciate the elegant device by which (in Figs. 69 and 78) the instantaneous axis, even when inaccessible, is made available for determining the relative velocities of the two ends of a link. The two following chapters, relating respectively to the pitch surfaces and the tooth outlines of gear wheels, are very much compressed; but justice to the author calls for decided commendation of his treatment of "frictional gearing," while, per contra, it must in justice to the reader be pointed out that the so-called "interference" of involute teeth is simply the result of making these teeth longer than possible, as had been clearly shown by the preceding argument.

Much of the matter thus far alluded to is in a sense theoretical; but the purely practical man will find in the fifth chapter many points of interest and value in regard to the laying out of cams to satisfy assigned conditions, and in the sixth chapter many others relating to the possibilities of link-work and the processes of adapting it to the requirements of the case in hand. The concluding chapters, on wrapping connectors and trains of mechanism, are exceedingly brief and call for no special mention.

Considering the work as a whole, it is certainly worthy of high commendation, for the intrinsic value of its contents; and the elegant appearance of the volume, with its clear typography and clean-cut illustrations, does equal credit to its publishers.

TRADE CATALOGUES.

The Union Switch & Signal Co., Swissvale, New York and Chicago, has begun to issue a series of "Bulletins," advertisements of its devices which will be convenient for filing and reference. Thus far there have been issued Nos. 1, 2 and 3, all of the uniform size of 6 in. x 9 in. No. 1 describes the 4-C relay for automatic block signaling. This relay, which has its armature and connections encased in an air tight box with a glass face, has made remarkable records for perfection of operation in automatic signaling, and the company has sold over 3,000 instruments. While the mechanism is tightly encased so as to prevent unauthorized adjustment, inspection is easy, and means is provided for conveniently testing an instrument. The case may be sealed so that whenever it is opened the inspector can be called to account. Being protected from dampness it can be used in battery wells. In this relay an ingeniously designed glass bearing is used for armature pivots which gives immunity from fusion by lightning discharges. The magnet coils may be tested or removed (separately) without opening the box. Relays with three points occupy the same space as a one-point relay. Platinum contacts are provided with a shunting device, eliminating the dangers to which ordinary relays are liable from fusing. The two-point relays are so made that the pressure is equal on each contact, irrespective of adjustment. The bulletin gives directions for ordering.

Bulletin No. 2 describes the encased disk signal made by the Union Company. The case of this signal is only 3 in. thick and is made of steel plates with air tight joints, excluding both dust and moisture. The lamp is outside the case and is hung on hinges like a door, so as to be turned around for cleaning and inspection. When in position for use it is locked so that tramps cannot open it. The electro-magnet is also outside the main body of the case. The disk is made of sheet aluminum and colored with elastic enamel, which does not collect moisture. The adjustment is therefore permanent, and frequent opening of the case is done away with. Aluminum is used in other parts of the mechanism. The familiar revolving armature is used and the winding of the magnet is done in a special way which, it is claimed, reduces the amount of current used. Where the color indication for all clear is green, the inner face of the back plate of the signal is enamelled green, and a special arrangement is used to show green at

night. The whole case, or banjo, is fixed on a swivel (with suitable lock), so that it can be turned around to enable the inspector or cleaner to reach all sides while standing on the ladder. When the signal is out of service it can be turned with its edge toward approaching trains.

Bulletin No. 3 is a pamphlet of 20 pages containing a reprint of Mr. Carter's paper on Automatic Signals for the International Railway Congress, which was published in the Railroad Gazette of Jan. 12. Both this pamphlet and Bulletin No. 2 contain illustrations of Union automatic signals.

Water Purification.—The Industrial Water Company, 15 Wall St., New York City, has issued a pamphlet telling something of the methods and apparatus which that company is now putting in use for softening and purifying water. This company furnishes apparatus for treating water for boilers, laundries, paper making and all industrial and domestic uses. The apparatus softens and purifies water before it enters the boiler or feedwater heater. It also extracts from condensed steam any oil, either mineral or animal, which has been picked up in the cylinders. It is claimed that by this process "perfect water may be obtained from almost any kind of raw water at an expense of two or three cents per thousand gallons."

Pneumatic Tools.—The Chicago Pneumatic Tool Company has just issued what is called a special edition of its catalogue No. 9, showing rivets, hammers, drills, etc. To this latest catalogue the company has added several new tools, such as the Boyer long stroke hammer, the improved Phoenix drill, new adjustment for some of the regular line of tools, etc. The pamphlet shows these pneumatic tools in use on a great variety of work, half-tone engravings from photographs being very liberally used.

The Boston Belting Co., Boston, Mass., has just issued two new catalogues, one entitled "Packings" and the other "Garden Hose." The former has an attractive cover of neat design and contains 40 pages of descriptions, illustrations and prices of the several kinds of packings, valves, gaskets and diaphragms made by the company. The other pamphlet has 24 pages covering cotton and rubber hose, couplings, nozzles, sprinklers and reels.

The Jones National Fence Company, Columbus, O., has issued a new 6x9 in. catalogue for 1900. This contains illustrations and descriptions of various styles of right-of-way and lawn fence, farm and ornamental gates and fencing tools. The method is also described of repairing old wire fences by means of the Jones flexible clamps, and the pamphlet contains several tables of useful information.

Browne & Sharpe send us their 1900 catalogue of machine tools and small tools. Some of the additions this year to their regular line are an automatic cutting off machine, automatic screw machine, circular milling attachment, high speed milling attachment, self oiling friction pulleys, new designs of milling machines and also quite a number of small tools in the way of calipers, gages, etc.

The Lowe Brothers Company, Dayton, O., has issued a pamphlet for the use of painters, being a discussion of modern painting. Directions are given for painting wood and other surfaces, and as to the proper brushes and paint to use. The methods used by the Lowe Brothers in making and testing paints are also described and illustrated.

Crerar, Adams & Co., Chicago, have issued a new illustrated catalogue of railroad supplies for 1900. This is 5x6½ in. book bound in leather, containing 508 pages, in which is listed practically all the special equipment used by railroads.

The Bullock Electric Manufacturing Company, Cincinnati, O., has issued a new pamphlet describing in detail its type "H" direct current multipolar motors. These motors range in size from 10 to 440 h. p. and are particularly suitable for use in railroad and other machine shops.

French and German Practice in Grouping Small Shipments of Freight.*

The question laid down in the programme (Subject 33) is, "Should Railway Rates Be Fixed so as to Encourage the Grouping of Goods in Order to Utilize the Rolling Stock to the Best Advantage, or so as to Dispense with Middlemen?" Grouping of shipments by the railroads themselves has already been considered by the Congress, and the present paper deals only with grouping by forwarding agents.

The French railroads have tariffs for quick freight and for slow; for the former there are three general tariffs; first, for all packages weighing less than 40 kilograms (88.2 lbs.); second, articles of food; third, general merchandise. The two latter classes, lower

than the first, are for weights above 40 kilograms. There are but few commodity tariffs for quick freight. For slow freight there is the usual classification, based entirely on value, but packages of less than 40 kilograms must pay higher than larger packages. There are many commodity rates. The slow-freight tariff is so well fitted to the needs of traffic that grouping is practicable only as applied to small packages.

A grouper, to get the advantage of a reduction, must pack his small packages together into one large package and the stamp tax must be paid on as many different receipts as there are actual receivers of the goods sent. As a matter of fact, there is not much grouping except in the case of quick freight packages, and even this practice has lately been diminished because parcel rates through the post office have been reduced, it being possible now to send a package of 22 lbs. by mail for about 25 cents, and the shipper escapes the stamp tax imposed on freight shipments. In 1897 the number of lots of grouped goods sent by quick freight from Paris over the Orleans Railroad was 924, while in 1898 it fell to 643. Ordinarily, goods of any kind may be grouped, but there are exceptions. For example, the tariffs on wine from Bordeaux to Paris for seven-ton and 20-ton lots have conditions so worded as to exclude from the low-rate privilege the more valuable wines. The low rates are made for the ordinary grades in order to enable them to compete in Paris with foreign wines, which are generally imported by water.

Three years ago the Northern, the Eastern, the Western and the Orleans companies did not allow grouping; the Southern (Midi) and the Lyons companies allowed grouping to a limited extent; the State roads and the Northern allowed some grouping, the latter imposing the requirement that the shipper and the consignee must load and unload. The Government having asked the railroads to make their rates more liberal, the above-named roads, which did not group, have expressed their willingness to do so; and during the past year the Northern and the Eastern have adopted entirely new regulations. The Northern has made a rate for full carloads of any kind of goods, all one kind or mixed, the minimum weight to be five tons to the car. The more costly kinds of drygoods and a few other valuable commodities are excluded from this privilege. The company will neither load nor unload, nor take the car to the freight house. The rate for this carload traffic is, on distances up to 62.1 miles about three cents per ton per mile, and for distances of 186 miles a little less than two cents per ton per mile. The Eastern has imitated this example, but with rates for both five-ton and 10-ton cars. The rates are about the same as on the Northern, but with about eight cents a ton added for station charges. On both these roads these carload rates are lower than those of the fourth class in the ordinary tariff. Experience with these tariffs has been too brief to enable any definite conclusions to be formed.

In international traffic the French roads have had to introduce grouping in order to give shippers suitable opportunity to take advantage of similar tariffs in the other continental countries. It is also an advantage to shippers to have an agent who deals with a large number of shipments to attend to the customhouse formalities.

The stamp tax on bills of lading in France is 6.7 cents on each quick-freight shipment and twice that sum on slow freight. As before noted, this tax is exacted for each shipment in a group. The booking fee, two cents on each consignment, is only charged once.

Groupers generally give the individual shipper more than half the profit. In the case of wine from Bordeaux, already mentioned, a grouper sending 20 casks weighing 11,000 lbs. would make a profit of 95 francs, of which he would give the public 70 francs and retain 25; in sending 40 casks, however (22,000 lbs.) he would take 68 francs and would give the public only 28.

All the French companies report that the amount of grouping is insignificant. On the Orleans road in 1897 it amounted to only 0.14 per cent. of the total tonnage. Even in international traffic the amount is small; the Eastern Company reported in 1897 only 6,500 tons.

French railroad managers say that the limited amount of grouping done on their roads presents no inconveniences; on the other hand, there are no great advantages. The company saves little or nothing in clerking, while it loses the two cents booking fee on each separate shipment. The utilization of rolling stock is not a great advantage and it might be brought about by the roads themselves just as well as to have middlemen do it. Several companies admit that in some cases the public gets quicker delivery. On the whole, it will be necessary to wait until the recently introduced changes have had time to show results before instructive conclusions can be formed from French practice. The Government is trying to induce all the companies to adopt the new regulations lately introduced on the Northern Railroad. Theoretically, it is undeniable that the

operations performed by groupers could be as well done by the companies; and when a railroad can afford to reduce rates it should give the benefit of the reduction to the shippers and not to a middleman.

French experience being so limited, Mr. Mange quotes German opinions. The Zeitung des Vereins of June and July, 1898, discussed the subject at length. It was there stated that the groupers introduced friction by not treating consignors uniformly, by favoring large shippers or neglecting small villages, and delaying goods to make full carloads. In 1895 Berlin sent out 240,000 tons of goods in small grouped lots out of a total of 585,000 tons (41 per cent.), while in the province of Brandenburg only three per cent. of the traffic was grouped. Again, groupers are free to change their rates at any time without notice, thus introducing objectionable instability. Another German authority, Mr. O. de Terra, Director of State Railroads, Frankfurt-on-the-Main, says (1895) that grouping really does not utilize rolling stock any better than the companies themselves can do, or at least not to an appreciable extent. The large shippers get the principal advantage and they even compel the groupers to divide the profits with them. The smaller shippers know nothing about grouping and small consignees, especially at small towns, suffer some inconvenience. Mr. Mange concludes that these conditions were understood by the principal German railroads; as, in October, 1898, the Prussian State Railroads reduced rates on small packages in certain cases, thus facilitating individual shipments. As the groupers have since complained, it is presumed that their business was actually diminished.

Mr. Mange's final conclusion is that neither the railroads nor the public will receive much benefit if the tariffs are managed so that the middlemen can make a good profit. To favor grouping by individual shippers is believed, however, to be a legitimate way of developing traffic.

Progress of the Mechanical Arts in Three-Quarters of a Century.*

By Coleman Sellers, E. D.†

I have already referred to the slow process of boring cylinders by hand power for pumping engines. When the early locomotives were built, for example, in the Niles Works, 1856, the boring of the cylinders was done on a 36-inch lathe with a horizontal boring bar, and without any knowledge as to the theory of boring in order to produce the best results. It always took two days to bore the cylinder of a locomotive of the size in use at that time, and I think the largest cylinders were not over 15 inches in diameter. In Philadelphia, when Baldwin's had advanced to a very large establishment, they still bored the locomotive cylinders in the same way. It was not until shortly before the Centennial Exhibition of 1876 that attention was turned toward the utilization of a theory that had obtained in limited practice some years before as to the improvement in boring metals, the idea being that the quickest and best work can be done in boring by making the roughing cut with a fine feed, removing as much metal as possible by depth of cut, and making the finishing cut with a very broad feed but light cut that would let the cutter pass through the hole to be bored as quickly as possible so as not to wear the cutting edge in passage.

That principle was first introduced when Mr. Asa Whitney of Philadelphia discovered that chilled cast iron car wheels could be made to compete with the best wrought iron ones and do a greater mileage. If the wheels cast in an iron mould were not allowed to cool naturally, but taken red hot from the chill, were put into the annealing furnaces and brought up to a heat a little below the melting point, and then allowed slowly to cool, they were found to be free from all internal strains, while wheels taken red hot from the mould would burst into three or four pieces in cooling, showing that there was violent internal strain in metal cast in that way under the tension of the heavy chill on the outside of the tread of the rim. The problem of boring chilled wheels was solved by taking advantage of the fine roughing cut and coarse finishing feed. Mr. Whitney desired to have wheels made interchangeable in their fit on the standard axles.

When the late Mr. Hudson had charge of the Rogers' Locomotive Works he applied to the firm of William Sellers & Co., to have a special locomotive cylinder boring machine designed and built, saying that he had seen a boring machine designed by Mr. Grant, of the Grant Locomotive Works, capable of boring a 19-in. cylinder in nine hours. The matter was referred to me, and when I came to calculate the theoretical time required for boring a cylinder of the size named, on the supposition that the speed of 16 ft. a minute might be used in making the cuts,

* From an address delivered in Convention Hall, National Export Exposition, October 5, on the occasion of the celebration of the seventy-fifth anniversary of the Franklin Institute.

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* Abstract of a paper to be presented at the sixth session of the International Railway Congress at Paris, 1900, by Mr. Mange, Engineer, Assistant to the Management of the Orleans Railroad, Paris.

with a fine feed and a deep cut for the roughing cut, and a shallow cut and a much wider feed for the finishing cut, I found that the estimated time amounted in all to only three hours, and named three and a half hours as not only possible, but what might be guaranteed as the productive output of such a machine. An order was given for this machine, it being understood that it was not only to bore the cylinders, but to counterbore the ends for the clearance of the piston, to cut off the sinking head and face up the flanges at each end of the cylinder. When completed, the first test was made with a 19-in. cylinder of hard close metal. This was bored in three hours and twenty minutes, exclusive of the time of setting the cylinder, which was not much on account of the peculiar arrangement of the machine, and the facility with which the cylinder could be put in place for boring. In this case the cylinder stood still, while the boring bar travelled lengthwise, carrying the cutter head with it, and upon the two face plates of the driving heads of the machine were arranged automatic slide rests that faced off the flanges. In this design there was no guesswork, as the principle of fine feed and deep cut on roughing, with very coarse feed and shallow cut for finishing, was in common use in all operations of boring, turning and planing metals, with exact knowledge as to what result was obtainable when the possible speed of cut per minute had been predetermined for the harness of the metal to be toolled.

A celebrated builder of locomotives in England told me that the rules of the Board of Trade and Parliamentary regulations for the safety of the people crowded their locomotives with useless appliances. A close observer of railroad machinery, who is familiar with the principal railroads in the world, has stated that if a locomotive builder abroad is given a new problem, such as to construct a hill-climbing freight engine, or a goods engine, as it is called abroad, or even an express passenger engine for mountain district, a completed machine may be the result that is a model of strength and durability, but inaccessible in the extreme when ordinary repairs are required. It is easier to take out the cylinders in an American engine and replace them with new ones than it is to reset the valves on the type in general use abroad, where the valve chests are crowded together under the smoke-stacks as though they would never require adjustment or resetting. The persistency evinced in adhering to the crank axle in English engines, in spite of its weakness, is one of the matters not understood in this country. Give accessibility to the valves, and ready access to all the parts, and the whole engine will be better cared for by those in charge of it.

We are long past the period of empirical work. The steel makers and iron founders now depend upon metallurgists to guide them, while every well-equipped machine shop in the country must have its staff of educated men who are able to reinforce the practical knowledge of those engaged in manufacturing by exact mathematical methods that in the early stages of our profession were limited to simple arithmetic.

In working iron and steel, the introduction of the Whitworth forging press marked an important advance compared with the costly steam hammers, and hydraulic presses became absolutely essential in perfecting the American type of link and pin bridge construction. Some of the forgings required for the 5,000 h. p. dynamos needed by the Niagara Falls Power Company could not have been executed by means of any existing steam hammer, and the Bethlehem Steel Company was the first to introduce this system of forging on a large scale. Forging by pressure in place of impact by hammers enables the force required to cause a given deformation of metal to be accomplished with the least expenditure of power and greater exactness, as was soon manifested in the readiness with which hollow shafts were produced. About 1893, the work at Niagara Falls called for steel rings of absolutely uniform density, having an outside diameter of 11 ft. 4 in., with a width on the face of approximately 50 in., and a thickness of over 5 in., which necessitated the use of a press of greater capacity than any heretofore erected. The press at Bethlehem, combined with the Whitworth system of compressed steel ingots, was taxed to its utmost to make what was needed in this case. It is interesting to note that this work was the first product of machinery introduced mainly to furnish armor plates and the massive steel forgings needed for our modern ships of war.

The plant of the Niagara Falls Power Company offers evidence enough of the remarkable progress that has been made, not only in the mechanic arts, but in the high scientific ability required to design machines that had no precedent in size or in exact requirements as expressed in the specifications predetermining each requirement as to the results to be accomplished. Thus the designers of the dynamos were called upon to guarantee an output from each unit of power with so high an efficiency that all the magnetic and electric losses in the machine would not amount to over 2½ per cent.

As now constructed, all the electrical and mag-

netic losses in each of the dynamos aggregate but 2½ per cent., and you can judge what the efficiency of the water-wheels must be when those which, at 75 per cent. efficiency, would give 5,300 h. p., are now giving dynamos that deliver 5,500 h. p. without any changes in the wheel, but only such alterations in seemingly immaterial parts as the design of the connection between the water wheels and the dynamos.

As regards the utilization of the power being developed at Niagara Falls, it may interest you to note that we hope shortly to have ten dynamos running, each of 5,000 h. p. nominal capacity, but actually capable of delivering over 5,000 h. p. each.

The first industry established in connection with the plant was a paper company, which required 7,200 h. p., but it installed its own wheels on land of the Power Company, and utilized the latter's tunnel and canal facilities. Next followed the Pittsburgh Reduction Company, which takes 8,550 elec. h. p. for the manufacture of aluminum. The Carborundum Company, for making abrasives, takes 1,030 elec. h. p. The Union Carbide Company, 5,000 elec. h. p., for the manufacture of carbide of calcium. The Niagara Electro-Chemical Company, making peroxide of sodium, that is, metallic sodium, takes 400 elec. h. p. These and other work now in operation or being installed will utilize, possibly by the first of next year [1900], a total of 41,000 h. p. Most of these establishments are electro-chemical or metallurgical in their processes, and have sprung into existence with the development of hydro-electric power, although they are based upon principles which were discovered years ago.

In the problem presented at Niagara Falls we had to provide for direct current to operate railroads and for electro-metallurgical purposes. This power is developed as alternating current, and transformed from two-phase into three-phase by an invention of Mr. C. F. Scott, of the Westinghouse Company. It is a noteworthy fact that, since the first wheels were started in 1895, there have been no stoppages of more than an hour or two at the most. The plant has been in operation night and day, carrying on processes that permit of no interruption on account of the loss which would result.

Reviewing the century's progress, one cannot but be impressed with the tendency to specialize all industries. It has been truly said that jobbing shops are and always will be a necessity, but that manufacturing establishments will lead in the march of improvement. Trades are becoming more diversified, and time, talent and capital are being expended upon individual machines and appliances as special which were formerly but a part of the output of single establishments. To this concentration of the best thought upon special branches of all industries we may attribute much of the progress in the mechanic arts made during the past 75 years, which has opened the markets of the world to the products of our industry. The influence of the Franklin Institute has played no small part in this progress, and as one long identified with its work, I extend my greeting to its members, hoping they will continue to advance the usefulness of an institution which worthily bears the name of one of the greatest philosophers that America, and the world, has produced.

TECHNICAL.

Manufacturing and Business.

The Charles A. Stickney Co., St. Paul, Minn., is now filling an order for combined gasoline engines and pumps to be shipped to the Alaska gold fields. The increase in railroad business will probably require doubling the capacity of its plant for gasoline engines.

The Navy Department has placed an order with the New York Air Compressor Co., 120 Liberty Street, New York, for two duplex compound air compressors of large capacity for the Charlestown Navy Yard, Boston, Mass.

J. W. Duntley, President of the Chicago Pneumatic Tool Co., has sailed for Europe to look after the interests of the company abroad. He will be absent about two months.

The Berlin Iron Bridge Co. of East Berlin, Conn., will open an office at Rooms 909-910 Stephen Girard Building, Philadelphia, to be in charge of L. H. Brumbough, who has been with the company for a number of years.

C. H. Howard has resigned as Secretary of the Safety Car Heating & Lighting Co., on account of having connected himself with other interests in the West, and S. B. Hynes will be elected to that position, assuming the duties about the 1st of April.

The Chihuahua & Pacific is in the market for engine and car wheels.

The Atlantic Gulf & Pacific Co., engineers and contractors, has removed its offices to the twenty-fourth floor of the Park Row Building, New York City.

Thornton N. Motley Co., 43 John St., New York City, are offering for sale five eight-wheel, one mogul and two consolidation engines, 15 cars for

passenger service and 142 freight cars. These are second-hand, of 3 ft. gage.

The Chicago Pneumatic Tool Co. has issued a letter to users of the Boyer piston air drills offering to equip the older forms of the devices with the latest improvements, including oiling attachments. In this way increased life will be given to the drills.

Iron and Steel.

A company has been organized to build a forging plant for armor plate and heavy gun forgings, and John Fritz, formerly Superintendent of the Bethlehem Steel Co., is reported engaged as Engineer. This is the project in which Mellon & Co., bankers, of Pittsburgh, are interested. About 30 acres of land on the Delaware River near Chester, Pa., have been bought.

The Empire Iron & Steel Co. has sold its rolling mill at Oxford, N. J., in addition to the Oxford furnace, to Janson Bros., who own a large iron plant at Columbia, Pa. The purchasing company consists of Frank, Joseph and Valentine Janson.

The output of iron furnaces to March 1 was 292,643 tons weekly, against 293,014 Feb. 1, and unsold stocks increased 35,516 tons in February, making the consumption 40,921 tons daily, against 41,642 tons in January.

The Pennsylvania Steel Co. has an order for 10,000 tons of rails for Japan. The Sparrows Point plant expects to complete the order of rails for the Trans-Siberian Railroad in May.

The Atkinson & Northern, H. W. Beon, Chief Engineer, Jefferson, Ia., will need 48,180 tons of 60-lb. rails.

About twelve miles of rails are wanted by the Chippewa Valley & Northern, being built by the Arpin Lumber Co., of Grand Rapids, Wis.

The Pittsburgh Dispatch reports the Pittsburgh iron and steel markets in practically the same condition they were at the beginning of the month. Bessemer pig is very firm at \$24, valley, and purchases are being made regularly at the full price.

The Roebling Construction Co. of New Jersey has been incorporated in New York. Offices are to be at 121 Liberty St., New York.

All bridge work for this year on the Lehigh Valley system is under contract with the A. & P. Roberts Co., the Union Bridge Co., Pennsylvania Steel Co., Passaic Rolling Mills Co., and the Elmira Bridge Co.

Robert Devine, heretofore manager of the Machine Shop Department of the Frankfort Steel Works, at Ellwood City, Pa., has become Superintendent of the entire works, succeeding his brother, W. J. Devine, deceased.

Jones & Laughlins, Ltd., of Pittsburgh, are about to connect the Eliza blast furnace of Laughlin & Co., on the Pittsburgh side of the Monongahela River, with their American Iron & Steel Works, on the south side, by way of the bridge of the Monongahela Connecting RR., now being rebuilt. Hot metal will be carried across the bridge.

The Champion Iron & Steel Co., Muskegon, Mich., has put in operation their new muck mill plant, which will increase the output of finished bars to 100 tons per day. The muck mill has four regenerative gas furnaces, with a capacity of 75 tons per day. The mill is driven by a 28 x 60 in. Wetherill Corliss engine. The building is 240 x 60 ft., with a lean to of 30 ft., covering all the furnaces. The open hearth steel plant is in operation again after an overhauling and remodeling, with an increase of capacity of 50 per cent. The foundations for the tin plate plant are finished and most of the machinery is on the ground, and it is expected to start four of the eight hot mills in about 60 days. D. M. Hills, heretofore President, and L. Friedman, Secretary and Treasurer, have retired. R. L. Henry, of Chicago, is now President, Theo. D. Morgan, former Vice-President and General Manager of the Atlanta Steel & Tin Plate Co., Atlanta, Ind., is General Manager, and Walter E. Stoy, formerly Secretary and Treasurer of the New Albany Iron Co., New Albany, Ind., is Secretary and Treasurer.

Bids are asked on about 34,000,000 lbs. of angles, plates and beams required for the 10-story steel frame building to be built for John Wanamaker in Philadelphia. The steel will cost over \$1,100,000 delivered in Philadelphia.

In our issue of March 2, page 140, we mentioned the new Portland Iron & Steel Co., of Portland, Me. This company has been incorporated under the laws of Maine, with a capital of \$75,000. The Directors are: Chas. T. Means, Superintendent of Manchester Locomotive Works, Wm. H. McGowan, Jr., A. H. Routwell, Eben D. Bancroft, Chas. M. Day, Perry H. Dow and John M. Russell. The officers are: Chas. T. Means, President; Wm. S. McGowan, Jr., Secretary, Treasurer and General Manager. The company expects to have the plant in operation in May. At first merchant bar iron, angle iron, railroad spikes and angle and plain fish plates will be made.

The Illinois Car & Equipment Co.

It is understood that Messrs. W. H. Patterson and A. C. and W. D. McCord have secured control of the

Illinois Car & Equipment Co., of Chicago. The English capital is still retained, but American interests have been added and hereafter the company is to be managed solely in this country. The report that McCord & Co. were to assume charge of the car company is erroneous and probably arose from the fact that the officers of the two companies are practically identical. A working arrangement between the two companies has been effected whereby a part or all of the specialties of McCord & Co. will be manufactured at the works of the car company. Various extensions and improvements in the plant are being made. For the present the work is to be confined to the making of forgings and castings and the building of wooden cars. Mr. L. Oberauer is retained as Superintendent and Mr. D. L. Markle as Assistant Manager.

Rapid Transit in New York.

Continuing the organization of the engineering staff to supervise the building of the underground railroad in New York, the Commissioners approve of the organization laid out by Mr. Parsons, namely, a chief engineer, a deputy chief engineer, six division engineers, three general inspectors, a private secretary, an auditor and a photographer, all belonging to the class exempt from civil service competition. Besides this there will be assistant engineers, instrument men, inspectors, etc., to be taken from the civil service lists. As we have already noted, Mr. George S. Rice has been appointed Deputy Chief Engineer. Mr. Albert Carr has been appointed Division Engineer in charge of the First Division from the Post Office to Forty-second street at a salary of \$4,500 a year. Mr. C. W. Hendrick has been appointed Engineer of Sewers at \$4,000 a year, and Mr. M. J. Farrell, Private Secretary to the Chief Engineer.

The Chief Engineer has been instructed to prepare an estimate of cost for pipe galleries alongside of or under the tunnel from City Hall to Thirty-third street.

The Long Island Tunnel.

It was announced last week that the Long Island Railroad Company had withdrawn its application for a franchise for a tunnel across the East River between New York and Brooklyn. To the many friends of this most important measure this probably was a disagreeable surprise, but we judge that it was only a step in actually furthering the enterprise. The Counsel for the Rapid Transit Commission has lately said officially that "the Long Island Railroad Company has abandoned its own tunnel scheme in order to be in a position to bid on a rapid transit tunnel in Brooklyn if the Board is placed in a position to let a contract for the construction of such a tunnel."

The City & South London Electric Railway.

We have heretofore given details of the extensions to this underground electric railroad. Permission for the extension to Moorgate St. City was granted by the Board of Trade Inspector, Sir Francis Marindin, on Feb. 24, and was opened on Feb. 26. The original terminus at King William St. is now closed, the cars being run through the new tunnels which have been built, as we have already indicated, underneath that station to the Bank station. The new stations opened are London Bridge, Bank and Moorgate St. The electrical machinery at the new power station is now in full swing.

Concrete.

At the Detroit meeting of the Association of Railway Superintendents of Bridges and Buildings, Mr. W. A. Rogers, Engineer of Permanent Construction of the Bridge and Building Department of the Chicago, Milwaukee & St. Paul, was appointed to present a paper on "Concrete" at the next meeting. This is a subject of much interest to railroad engineers and it is desired to get together as much information as possible as to the practice and experience of different roads. To bring out an expression of opinion as to whether concrete is a suitable and economical material for bridge piers, abutments, culverts, arches, etc., it is desired that answers to the following questions be sent to Mr. Rogers at Chicago:

For what classes of structures do you use Natural cement concrete?

What proportions of materials do you use in making Natural cement concrete?

For what classes of structures do you use Portland cement concrete?

What proportions of materials do you use in making Portland cement concrete? If you use a different proportion for different classes of work, please give that for each class.

If you have a cement specification please send a copy. Please state your requirements as to the sand, gravel, stone or other aggregates used.

Please state the process followed in mixing and placing concrete. If you use a machine for mixing, please state the kind, and say if in your opinion better results are obtained with it than may be obtained by hand mixing.

Do you prefer a dry, moderately wet, or wet mixture? By dry mixture is meant one which requires a repeated ramming to bring water to the surface; by wet mixture is meant one which quakes when slightly rammed.

Have you experienced any trouble on account of cracks forming between successive layers of concrete, especially when one layer has been placed after the one below has started to set? What method have you adopted to obviate this difficulty?

What if any provisions do you make for expansion and contraction due to changes of temperature?

Do you face concrete exposed to the weather? Please describe the facing used, and method of putting it on, and say if you have had any trouble with its cracking off?

Please describe the form of mould you use.

Have you had any experience which leads you to think either favorably or unfavorably as to the practice of mixing concrete in freezing weather?

What has been your observation as to the action of frost on Natural or Portland cement concrete after it has set?

Please give the amount of cement and the various aggregates required to make a cubic yard of concrete of the proportions you use.

Please state the cost per cubic yard for the labor of mixing and placing, stating the rate per day for labor on which this is based, and just what items the cost covers.

What difference in cost between concrete and stone masonry do you find?

Please give the results of any experiments you may have made to throw light on the properties of concrete.

Please state any reasons you may have for or against the use of concrete in railway bridge or building work.

THE SCRAP HEAP.

Notes.

Vice-President Thomas H. Hubbard, of the Southern Pacific, has given to 21 enginemen, firemen and shophmen on the road free scholarships in an Eastern Correspondence School.

On Feb. 12 the Black Diamond express, No. 9, of the Lehigh Valley, ran from Hinman to Geneva, 45 miles, in 37 minutes, equal to 73 miles an hour. The engine was No. 670.

Citizens of Puerto Rico having asked for legislation to authorize the construction of railroads, a bill has been introduced in the Lower House of Congress to enact for Puerto Rico the railroad laws of North Dakota.

Buffalo newspapers report that the railroad companies and the express companies doing business in that city have subscribed \$300,000 to the capital stock of the Pan-American Exposition. The promoters of the exposition had hoped to get \$600,000 from these sources.

Mr. William B. Hunter, Advertising Agent of the Delaware, Lackawanna & Western, while continuing to perform his present duties, has been appointed Industrial Agent of the road and will make it a part of his duty to promote the location and development of manufacturing industries along the lines of the company.

The Kentucky Legislature has passed the McChord railroad bill, giving the Railroad Commission the arbitrary right to fix freight rates when complaint is made. The bill fixes a fine of from \$500 to \$1,000 for the first violation and from \$1,000 to \$5,000 for each subsequent violation of the rate so established, and allows no appeal from the decision of the commission. The bill was passed by both houses in 1898, but vetoed by Gov. Bradley and failed to pass the Senate over the veto. The measure was one of the chief issues in the last campaign. Mr. McChord, who is the author of the bill, is a member of the Railroad Commission by election.

Lowering Chicago River Tunnels.

An ordinance providing for the lowering of the street railroad tunnels under the Chicago River was introduced into the City Council on March 5, and was ordered deferred and published. It provides for a depth of 21 ft. from dock to dock, and that work must be begun within three months from the passage of the ordinance and completed by March 1, 1901. The plans are to be approved by the Commissioner of Public Works and the work is to be done by the street railroad companies at their own expense.

The Bridge Wreck at Terre Haute.

We published March 2, page 134, a short account of a bridge wreck on the line of the Big Four at Terre Haute, Ind. The wreck took place Feb. 23 and trains ran over the break Friday morning, March 2, or a little less than seven days after the accident. In the week ending March 9 traffic over the temporary structure had been stopped twice because of damage done by ice. The water in the river is now 10 ft. higher than it was at the time of the accident, the estimated depth being from 35 to 40 ft. at the middle of the temporary structure. This temporary structure consists of a pile bridge with an opening about 50 ft. long near the middle spanned by two wooden stringers about 52 in. deep.

A Red Hot Collision.

One of the every-day sights on the Union Railroad at Pittsburgh is a train of cars carrying big "ladles" filled with several tons of molten iron or steel. One night not long ago a little collision in the yards of the Duquesne Steel Works upset a half-dozen of these cars, and the flood which ensued, with the attendant excitement, is reported in the McKeesport Herald. Says the Herald:

George Keeler is an engineer on the Union Railroad. His engine hauls the hot metal cars to and fro between the Duquesne steel converters and the open hearth furnaces at Homestead. Only a week ago while taking a train to Homestead one of the cars upset and poured the molten steel over the railroad bank, but beyond the loss of a lot of steel no damage was done. About three o'clock yesterday morning Keeler had just completed making up his train. It consisted of 10 ladle cars, each holding 24 tons of steel that had just been poured from the converter. He was about ready to pull out for the three mile run to the Homestead mills when another train of empties was pushed against his, "side wiping" it. In an instant six of the cars had been upset. The steel flowed down about the engine on both sides of the track and before Keeler and his fireman could get away there was a wild river of molten metal

rushing past their engine and shutting them in. Fortunately the cab was made of steel. Had it been of wood as on other engines the two men would have had no choice but to leap that flood or be roasted alive. No wood could have withstood that heat more than a minute or two. As it was the men were able to stay in their cab until the steel had cooled down a trifle when they uncoupled their engine from the derailed cars and pulled away. Beyond the spilling of 144 tons of steel no damage was caused by the wreck.

Traffic Notes.

The general freight tariff for the railroads of Arkansas, which has been prepared by the Railroad Commissioners of that State, was made public on March 1. It is roughly estimated that the new rates will average 20 per cent. lower than those heretofore in force.

The railroads leading from the Ohio, West Virginia and Pennsylvania soft coal districts to Lake Erie have agreed to advance rates 10 cents a ton, the new tariffs to begin March 21. The new rates are: From the Ohio fields, 77.5 cents a ton; from Pittsburgh, 80 cents, and from West Virginia, 88.75.

Eastbound rates on export grain are reported to be still badly demoralized. At the beginning of last week the Missouri Pacific made radical reductions from Kansas City to St. Louis, and this move is said to have helped to prevent any improvement east of Chicago and the Mississippi River. The reduction of the Missouri Pacific was, on wheat, from nine cents to four cents, and on corn from seven to four. On Tuesday of this week the Burlington announced reductions at Omaha, on grain carried east through Chicago, to meet the reductions of Missouri Pacific.

The presidents of the railroads west of Chicago met in New York last week, and after the meeting it was reported, as in the case of previous meetings, that the results had been satisfactory. No particulars were given. Chicago correspondents report, however, that all rates west of Chicago are in better shape than ever before, and it is asserted with positiveness that the payment of commission on tickets has been entirely stopped, sealing the fate of the scalper. If we accept these reports at their face value, we have the somewhat unusual spectacle of a decidedly better rate situation west of Chicago than east of that city.

Passenger officials of the railroads between New York and Chicago are said to have settled all their differences and the Soo Line has agreed to withdraw its low passenger rates from Minneapolis and St. Paul to the East. The roads between St. Paul and Chicago have agreed to restore rates on March 20 and the Soo restoration takes effect March 25, so that before the first of April it is expected that irregular rates will have been abandoned everywhere. In accord with the agreement made at the late conference of Western presidents in New York, the Northern Pacific and the Great Northern have officially announced the withdrawal of the one way colonist rates of \$25 to the Pacific coast, which threatened at one time to upset the agreement abolishing commissions. The normal second-class rate from St. Paul, beginning March 20, will be restored to \$40. The Canadian Pacific insisted that the regular home-seekers' excursion rates in effect two days of each month would amply care for actual settlers going West and agreed to cancel its rates if the Great Northern and the Northern Pacific did so first. It has agreed to do this on the 25th.

A Sleep of 17 Years.

In a lecture on "Railroad Hygienic Problems," by Dr. Gilbert, Consulting Physician of the Saxon State Railroads, the following account is given of a case of the results of a railroad accident: "In December, 1882, by the parting of a train, a brakeman was thrown off, and because of injuries to the soft parts of the head and contusions on the body was admitted to the Freiberg hospital, and after January, 1883, was treated at his home. In March, 1883, after his wounds had healed completely and three months after the accident, a condition resembling sleep set in, which has lasted ever since, now 17 years. In this time the patient has not spoken a word nor walked a step; he lies in bed like a living corpse. Constant involuntary discharge of the bladder; constant constipation; constant trembling of the eyes and twitching of the facial muscles, characterize the illness now, which formerly was complicated by convulsions. Fluid nourishment is swallowed as soon as the spoon touches the tongue. For years the patient was reduced to a skeleton, but now he is sufficiently strong and has a healthy skin. All possible diagnoses of the case have been proposed and rejected. What are the anatomical, what the functional disturbances here, in a case beginning three months after the healing of the wounds and without any perceptible injuries to the skull?"

The Grand Trunk International Bridge.

As already noted in the Railroad Gazette, the Grand Trunk Ry. will rebuild the International Bridge over the Niagara River, at Black Rock, below Buffalo, N. Y. The bridge was built in 1870. The official announcement states that arrangements have been made for the renewal of the superstructure of the bridge, the property of the International Bridge Co., controlled by the Grand Trunk. The bridge consists of two distinct and independent structures. One of these is the bridge across the Niagara River proper; the other is that across Black Rock Harbor. The bridge across the river consists of eight spans and has a total length of 1,967 ft. Two openings are bridged by the arms of the draw girder, which has a total length of 362 ft. The length of the bridge across Black Rock Harbor is 517 ft. The draw span of this bridge has a clear opening of 107 ft.

This work is being done to meet the requirements of the increasing weight of rolling stock. The contract was let to the Detroit Bridge & Iron Works some time ago, and it is expected work will soon be begun.

The Chicago Lake Front Suit.

The United States Supreme Court has decided the case against the city of Chicago which was brought by the Illinois Central Railroad to secure right to certain lands on the front of Lake Michigan. The decision of the Illinois State Supreme Court, which was against the railroad company, was affirmed. The case was a bill in equity instituted by the Illinois Central to obtain an injunction restraining the city from interfering with the exercise of the right of the I. C. to fill in for railroad purposes certain lands submerged by the shallow waters of Lake Michigan in front of property owned by the roads and situated between Twenty-fifth and Twenty-sev-

enth sts., Chicago, the purpose of the railroad company in reclaiming the land being to erect an engine house upon it.

The Court held that a grant of lands does not pass title to submerged lands, and also that the grant of "waters" in the railroad charter does not mean "a general grant of the waters of Lake Michigan." The opinion of the Court was handed down by Judge Brown. He said: The position of the railroad company under these sections, presupposing, as it does, a vested, continuing, and irrevocable right for all time to use such of the shallow waters and submerged lands of Lake Michigan as it may now or hereafter find to be necessary to the proper and complete operation of its road and a surrender by the city of all power of interference, is certainly a somewhat startling one. We are asked to say that not the State, but a railway company, is vested with a power which in the course of time and in the increasing magnitude of its business, may enable it to do by indirection or peaceable, what it has been held the State could not do directly—take the whole water front of the city to the limit of navigation for the operation of the road, and that, too, without the consent and against the protest of the city. An examination of the charter reveals the fact that instead of granting this power in precise and definite words the implication is clearly against the power claimed. But even if the grant were as broad as claimed, and gave the company a right to take parcels of submerged land, it could not do so without the consent of the Common Council. The contention of the railroad company that the restriction applies only to the city as bounded in 1851, is also held to be unsound.

New York Bridges.

The Board of Public Improvements has received a communication from Commissioner of Bridges John L. Shea requesting the Board to prepare the necessary resolutions toward the filing of the map, the acquiring of land and the beginning of condemnation proceedings by the Corporation Counsel for the bridge over the East River known as Bridge No. 3, extending from Pike Slip, Manhattan, to Washington Street, Brooklyn.

The weekly report of Engineer Buck on the New East River bridge shows that during the week ended Mar. 10, nearly all of the material for the main tower on the Manhattan side below the roadway has been delivered and is being put in place. On the Brooklyn side, all of the pedestals for the main tower have been set, and the derricks for erecting the main tower to the roadway have been completed.

New York City Bonds.

The Comptroller of New York City wants proposals for \$4,690,000 corporate stock of the city bearing interest at 3½ per cent. The stock is to be issued for the following purposes:

- \$1,000,000 for the new East River bridge.
- \$750,000 for the new Hall of Records.
- \$490,000 for schoolhouses and sites therefor in the Borough of Brooklyn.
- \$2,450,000 for funds to provide for paving streets.

The Hudson River Bridge.

The United States Senate on March 8 passed Senator Sewell's bill extending the time for the completion of the North River Bridge Company's bridge across the Hudson River to Jan. 1, 1902. Public hearings are soon to be given on the application of the bridge company for terminal facilities in New York, consisting of an elevated structure from Fifty-ninth St. south, possibly to the Battery. The sub-committee of the City Council suggests that if the application be granted the company shall pay the city 4 per cent. of its gross receipts for a certain period, 8 per cent. for another period, and, later, 12 per cent.

A Train Accident.

Miss Betsey D. K. stepped on the south-going train last Thursday.—N. Y. Sun.

Yellow Signal Lights.

We understand that the Cleveland, Cincinnati, Chicago & St. Louis has decided to use green for the all-clear indication in fixed signals at night, and has adopted Baird's yellow glass for use in distant signals.

South American Notes.

The Bolivian Government has granted authority to the North Argentine Ry. to extend that line to the city of Oruro, Argentina, about 280 miles from the boundary line. Juan V. Chilley of Cruz del Eje Cordoba is Chief Manager.

The "Ferro-carriles Economicos del Sud Este de Buenos Aires," whose president is Senor Augustin Molina, Calle Piedras 150, Buenos Aires, Argentina, hold concessions for a narrow gauge railroad from Mar del Plata to Balcarce and Tandil and Mar del Plata to Loberia and Necochea, a distance of 170 miles, and it is stated that construction will be begun in the near future.

The Conde d'Eu Co. has been authorized to finish and work the section from Mulungu to Alagoa Grande, in the state of Parahyba, Brazil, Mr. H. G. Sumner, located at Parahyba, is General Manager and Resident Engineer of this railroad.

The Government of Chile has granted a concession to Senor Augustin Ross, S. Donoso 5, C. T. 461, Valparaiso, for building and working a railroad between the coal mine known as Mina Loreto and the port of Punta Arenas, on the Straits of Magellan.

A project has been presented to the Minister of Public Works and the Argentine Congress to build a narrow-gauge railroad of 2 ft. 6 in., starting from Posados on the Parana River to San Xavier on the Uruguay, about 75 miles. Dr. Emilio Civit is the Minister of Public Works at Buenos Aires.

The Argentine Senate has sanctioned a concession for a railroad from Port Piramides to Salinas Grandes, Chubut, applied for by Mr. Ernesto Plaggio, Calle 25 de Mayo, Buenos Aires.

Technical Schools.

Lewis Institute, Chicago.—The present buildings of this Institute were designed to accommodate 1,000 students, but the enrollment is now 1,700 and is expected to reach 2,000 next fall. To take care of this increased attendance an addition will soon be built adjoining the present buildings at Robey and West Madison sts. The new building will front 120 ft. on Robey St. It will be 66 ft. deep, two stories high at first and four more stories will be added later. The basement will be used for engineering laboratories and the new building will be completed in July.

Capt. Robt. W. Hunt, of the R. W. Hunt Co., gave

a lecture before the engineering students of the Institute on the evening of March 7, upon "Iron and Steel Manufacture in Sweden." The lecture was illustrated by stereopticon views.

University of Illinois.—The annual banquet of the University of Illinois Club of Chicago was given at the Auditorium on March 9 and was attended by President A. S. Draper and several members of the faculty of the University and by a number of the alumni of the University. The principal address of the evening was made by President Draper. He said that eight years ago, when the University was 24 years old, there were 533 students. Now there are 2,200 students representing 93 of the 102 counties in the State and including also students from Cuba, from four of the provinces of the Dominion of Canada and from nine foreign countries. When the University was 24 years old, the teaching force numbered 50 persons, while now it numbers 224 persons, an increase of 174 in eight years. Dr. Draper also spoke of the needs of the University, among them being a new chemical laboratory, a large assembly room, enlarged libraries, and additional equipment in many departments.

Prof. L. C. Breckenridge gave an illustrated lecture recently before the Students' Engineering Society at the University on "Boiler Explosions."

Mr. A. V. Abbott, Chief Engineer of the Chicago Telephone Co., who is well known for his special work in radiography and wireless telegraphy, delivered a lecture to the students of the College of Engineering at the University on Thursday evening, March 1.

LOCOMOTIVE BUILDING.

The Pennsylvania has ordered 40 locomotives from the Baldwin Locomotive Works.

The Mahoning Ore Co. has ordered one locomotive from the Baldwin Locomotive Works.

The Brainard & Northern Minnesota has ordered 3 cabooses from the Mt. Vernon Car Mfg. Co.

The Indiana, Illinois & Iowa is preparing specifications for a considerable number of locomotives.

The Mississippi River & Bonne Terre is having three locomotives built by the Baldwin Locomotive Works.

The Missouri, Kansas & Texas is said to have ordered five locomotives from the Baldwin Locomotive Works.

The Chicago, Rock Island & Pacific has ordered six locomotives from the Baldwin Locomotive Works, but the type has not yet been decided upon.

The Toledo, St. Louis & Kansas City is said to be considering new locomotives, but it is not probable that an order will be placed until the road is reorganized.

The Colorado & Cripple Creek District, now building, is said to be considering a few locomotives. A. C. Ridgeway, of Colorado Springs, Colo., is General Manager.

The Lake Shore & Michigan Southern has ordered from the Brooks Locomotive Works 25 consolidation and five 10-wheel passenger locomotives, noted last week, both types to be duplicates of engines now in service.

The Louisville & Nashville order for 10 engines placed with the Cooke Locomotive & Machine Co. and referred to last week are of the consolidation type for July delivery, and will be in all respects the same as the one illustrated in the Railroad Gazette of Jan. 26, 1900.

The Atlantic Coast Line has ordered six 10-wheel freight engines with 19 in. x 26 in. cylinders and 63 in. driving wheels from the Richmond Locomotive & Machine Works. They will weigh 140,000 lbs., with 102,000 lbs. on the driving wheels.

The Chicago & Great Western order with the Richmond Locomotive & Machine Works, referred to last week, calls for 10-wheel passenger engines, to weigh 140,000 lbs., with 100,000 lbs. on the driving wheels, for October delivery. They will have 20 in. x 26 in. cylinders; 68 in. driving wheels; straight top boilers with 270 tubes 2 in. in diam. and 14 ft. 5 in. long, and a working steam pressure of 200 lbs.; fireboxes, 103 in. long and 42 in. wide; and a tender capacity for 6,000 gals. of water.

Chicago Great Western has ordered from the American Car & Foundry Co. 500 box cars and 200 fifty-foot furniture cars, noted February 9. They will all be of 30 tons capacity and for July or sooner delivery. The equipment includes Barber trucks, Chicago roofs, Kewanee brake beams, Westinghouse Air Brakes, Dayton Malleable Iron Co.'s draft rigging, McGuire grain doors and Bettendorf bolsters on box cars. The 10 stock cars will be let next week and the mixed lot of nine cars for passenger service, this month.

The Lehigh Valley order for three passenger engines placed with the Baldwin Locomotive Works calls for engines of the Atlantic type for delivery in May. The specifications call for cylinders 20 in. x 26 in.; driving wheels 80 in. in diam.; weight on drivers, 90,000 lbs.; steam pressure, 200 lbs.; grate area, 67½ sq. ft.; heating surface, tubes, 2,631 sq. ft.; fireboxes, 1,675 sq. ft.; total, 2,798 sq. ft.; 326 boiler tubes 2 in. in diam. and 15 ft. 6 in. long; fireboxes, 90 in. x 108 in.; tender capacity, 4,500 gals. of water. The special equipment includes Westinghouse air brake and train signal equipment, Metropolitan injectors, Nathan lubricators, Franklin sectional boiler covering, Taylor iron for staybolts, Carbon steel for boiler and firebox plates, Consolidated safety valves, U. S. Metallic piston and valve rod packings, Latrobe tires, Gould pilot and tender couplers, Leach sanding devices, Crosby chime whistles, Ashcroft steam gages and Dressel 16 in. circular headlights.

CAR BUILDING.

The Omaha Packing Co. has ordered 50 cars from F. M. Pease.

The Great Northern is having 400 box cars built by Haskell & Barker.

The American Glucose Co. is reported to be considering a small lot of tank cars.

The Lehigh Valley is said to have ordered six passenger cars from the Pullman Co.

The Northern Pacific will use McGuire grain doors on 500 cars building at its own shops.

The Chihuahua & Pacific has placed an order with Barney & Smith for fifteen 36-ft. box cars.

The Fonda, Johnstown & Gloversville has ordered 10 cars from the American Car & Foundry Co.

The General Chemical Co. of New York has ordered five tank cars from the Illinois Car & Equipment Co.

The Terre Haute & Indianapolis is having 360 cars built at the Terre Haute shops of the American Car & Foundry Co.

The South Chicago Teaming Co. has ordered 30 gondola cars of 80,000 lbs. capacity from the Illinois Car & Equipment Co.

The Chicago & Eastern Illinois is said to have ordered from the American Car & Foundry Co. the three chair cars noted last week.

The Oregon Short Line, we are officially informed, does not expect to order any freight equipment during 1900 except about eight special cabooses. These may be ordered shortly.

The New England Gas & Coke Co., we understand, bought from the South Baltimore Car Works some second-hand equipment and will not order the 150 new cars previously referred to.

The Drew Lumber Co., of Columbia, Fla., will build at its own yards a number of freight cars for the Suwanee & San Pedro RR. and wants prices on the necessary special equipment for these cars. Address Geo. L. Drew, President.

The Chicago & Eastern Illinois has ordered 100 forty-ton steel drop bottom gondola cars from the Pressed Steel Car Co., and we are reliably informed that the road has also ordered 250 forty-ton coal cars from the Mt. Vernon Car Co., that the order is about being increased to 400 and that the road is also getting prices from American Car & Foundry Co. on 200 of the same kind.

The New York Central & Hudson River order for 20 baggage cars placed with the American Car & Foundry Co. and referred to last week, calls for cars to measure 60 ft. long, for June and July delivery. The special equipment includes National hollow brake beams, Westinghouse brakes, Magnus Metal Co.'s brasses, Gould couplers and draft rigging, McCord journal boxes, Gould platforms, French springs and Paige steel tired 36-in. wheels.

The Chicago, Burlington & Quincy, as noted on Mar. 2, has ordered six chair cars from Jackson & Sharp. Four of the same kind have been ordered from the Pullman Co., and all are for June delivery. These cars are to be 60 ft. long and will be equipped with Chicago, Burlington & Quincy trucks, steel axles, Steel Tired Wheel Company's wheels, Westinghouse air brakes, phosphor-bronze brasses, Janney couplers, Pantasote curtains, with the Curtain Supply Company's fixtures, Baker heaters with Gold steam heating attachments, Pintsch gas, Scarritt twin reclining chairs, French springs and wide vestibules.

BRIDGE BUILDING.

ALLEGHENY, PA.—The Pittsburgh, Fort Wayne & Chicago RR. bridge across the Allegheny River and Robinson St., Allegheny, collapsed with a freight train last week.

ALEXANDRIA, LA.—People of Alexandria and Pineville are considering building a toll and traffic bridge across the Red River between those places.

ALLENTOWN, PA.—The County Court has approved the report of the viewers for a county bridge over Cedar Creek near the Fish Weir in South Whitehall Township.

Viewers have been appointed for a bridge over Trout Creek at Slatington.

Estimates have been made and submitted to the County Court for the proposed bridge across the Lehigh at Allentown, which are \$113,000 and \$133,000 respectively. The bridge would be 880 ft. long, and the different costs are estimated according to the width.

BENTON, TENN.—The Polk County Court during the April Term will consider the advisability of spending \$25,000 for new bridges.

BOISE, IDA.—The County Commissioners have authorized a bridge built across the Boise River at Government Island. It will be 500 ft. long and of two spans. The estimated cost, \$20,000, includes all work.

BURK'S FALLS, ONT.—A government engineer has been making surveys for a bridge to be built across the Magustawan River at this place by the Ontario government.

CAMBRIDGE, MD.—The Lower House of the Virginia Legislature has passed a bill authorizing Dorchester County to issue bonds to build a bridge at Harrison's Ferry.

CARBONDALE, PA.—Among the improvements which will probably be made at this place this year is a new bridge over Racket Brook on North Church St.

CHESTER, ILL.—The St. Louis, Low Grade & Southern will need two steel bridges on the proposed line. Louis Dedenbostel, President. (See Railroad Construction column.)

CHICAGO, ILL.—The Department of Public Works will receive bids May 15 for a drawbridge over the Calumet River at Fifty-ninth St.; also the approaches thereto. A certified check for \$5,000 is to accompany each bid. L. E. McGann, Commissioner of Public Works.

It is reported that City Engineer Ericson will at once prepare plans for 12 or 14 new bascule bridges to replace the center pier bridges over the Chicago River, and that the new appropriation bill now being prepared will contain an appropriation of \$2,500,000 for these bridges. The Trustees of the Chicago Sanitary District will be asked to replace the bridges over the South Branch of the Chicago River.

COLUMBIA, FLA.—The Drew Lumber Co. will build a bridge across the Suwanee River on the

line of the Suwannee & San Pedro RR., for which it has a contract. Geo. L. Drew, President.

CONNELLSVILLE, PA.—The bridge which the boroughs of Connelville, New Haven and Mount Pleasant and the Uniontown St. Ry. are considering building over the Youghiogheny River between Connelville and New Haven will be about 500 ft. long, and the present estimate places the cost at \$40,000.

DENVER, COLO.—J. O. Patterson has the contract for the superstructure of the South Fourteenth St. viaduct, the price being \$6,648. The other bidders were the Midland Bridge Co., \$6,800; Pueblo Bridge Co., \$7,400, and J. W. Hoover, \$7,049.

EDGE HILL, ONT.—James Staples wants tenders for a bridge 200 ft. long, to replace the Glencross bridge.

EXETER, PA.—A bridge has been asked of Luzerne County over the Antietam Creek near Black Bear.

GENEVA, IND.—It is stated that a contract will be let in about 30 days for the bridge proposed by the Grand Rapids & Indiana across the Big Lumberlost.

GERING, NEB.—Two new bridges are proposed across the North Platte River by Scotts Bluffs County.

GLEN OLDEN, PA.—It is understood that the Philadelphia, Wilmington & Baltimore has prepared plans to abolish the grade crossing on Glen Olden Ave., which will probably cost \$18,000.

GRAND RAPIDS, MICH.—Kent County will build two bridges over the Grand River during the present year, one near Plainfield and the other at Ada.

The City Council has voted against submitting to a vote the proposition to bond the city for \$150,000 for a new bridge at Bridge St. A new approach will be built to the present bridge. Also a concrete arch bridge will be built over the East Side Canal, the work to cost about \$13,000.

HOLYOKE, MASS.—The bridge proposed over the second level canal will be a stone arch, of three spans, in all about 110 ft. long. The total estimated cost is placed at \$30,000. We are told an iron structure to cost about \$16,000 may be built.

HOUGHTON, MICH.—A bridge will be built by the Isle Royale Copper Co. for their railroad to cross the Duluth, South Shore & Atlantic at a place called Pilgrim.

HUMBERSTONE, ONT.—Bids are wanted by the Department of Railways & Canals until March 23, for a steel highway bridge to cross the Welland Canal near this place. Plans and specifications can be seen at the office of the Engineer of the Welland Canal at St. Catharines, Ont.

JERSEY CITY, N. J.—The Senate has passed a bill permitting Hudson County to appropriate money to build bridges over streams separating adjacent counties.

KANKAKEE, ILL.—All the bids received on March 2 for a cement-concrete bridge across the Kankakee River at Washington St., were rejected. The bids were: J. C. Darst, Chicago, Ill., \$44,500; Chicago Bridge & Iron Co., \$49,800; Geisels Construction Co., St. Louis, Mo., four bids, (1) \$45,960, (2) \$39,980, (3) \$39,230, (4) \$35,495; Stamsen & Blome, Chicago, \$68,000; Bannan & Connolly, Joliet, Ill., \$62,500. H. C. Clarke, President of the Board of Local Improvements.

KINGSTON, ONT.—The present bridge at Cataract will be replaced by a steel structure, according to report.

LEWISTON, CAL.—The bridge proposed by Trinity County over Trinity River, which is to be a single span of 180 ft., is estimated to cost between \$9,000 and \$12,000. H. C. Ingram, Weaverville, County Surveyor, will make the plans. Bids will probably be wanted in April. (Feb. 16, p. 110.)

LOUISVILLE, KY.—The Jefferson County Court has voted an appropriation for bridges this year to be built under the supervision of R. H. Young, County Engineer.

MORGANTOWN, W. VA.—The Morgantown Bridge & Improvement Co. has been incorporated in this State, with a capital of \$250,000. I. G. Lazelle and L. J. Frazer of Morgantown are interested.

NORRISTOWN, PA.—The Grand Jury has approved the report of viewers recommending a bridge across the Perkiomen Creek in the Township of Upper Salford.

OTTAWA, ONT.—Bids are wanted March 23, for the steel bridge over Rideau Canal at Maria St. The plans and specifications are at the office of the Department of Public Works at Ottawa.

Considerable money will be spent for bridge work by the Intercolonial, as noted in the Railroad Construction column.

PHILADELPHIA, PA.—The Union Traction Co. will probably build a bridge at Coulter St., over the Philadelphia, Germantown & Chestnut Hill RR., at a cost of \$30,000. The city has voted an appropriation of \$10,000.

PITTSBURGH, PA.—The War Department has appointed Commissioners to pass upon the proposed improvements of the Pittsburgh, Fort Wayne & Chicago bridge across the Allegheny River at Tenth St. The company contemplates widening the present span piers and abutments sufficiently to permit placing two additional tracks on the bridge.

POMONA, ONT.—Glenn township council has instructed the reeve to secure plans for a new bridge at lot five, concession G.

PORT ANGELES, WASH.—The Board of Commissioners of Clallam County wants bids April 3 for a Howe truss bridge, with approaches, across the Solduck River in Section 11. Thomas T. Aldwell, County Auditor.

READING, PA.—See Philadelphia & Reading in Railroad Construction column.

RED WING, MINN.—We are told that it is not definitely decided what to do with the Wisconsin Channel bridge. The new structure will be of iron and about 600 ft. long. W. E. Taylor, City Clerk.

ROCKVILLE, MD.—The Washington & Rockville Electric Ry. Co. have petitioned the County Com-

missioners for permission to build an overhead bridge at Buck Lodge.

ROME, N. Y.—A bill has been introduced in the Senate appropriating \$14,000 for a new bridge over the Erie Canal at South George St.

ROUSES POINT, N. Y.—The War Department has approved the plans of the Rutland RR. bridge across Lake Champlain at this place.

SONOMA, CAL.—A bridge has been recommended over the creek on France St. Plans and specifications are to be made immediately.

SOUTH OMAHA, NEB.—We are told that nothing definite has been decided regarding the proposed O Street bridge by the Union Stock Yards Co.

SYRACUSE, N. Y.—The bill appropriating \$11,500 for a hoist bridge over the Erie Canal at Catharine and Almond Sts., Syracuse, passed the Senate March 1.

TEKAMAH, NEB.—The Supervisors of Burt County rejected all bids received March 6 for bridges to be built during 1900. New bids are to be received on or before April 10. W. A. Moyer, County Clerk.

TOPEKA, KAN.—It is stated that the Chicago, Rock Island & Pacific will replace five or six of its wooden bridges near Topeka with iron structures, the work to start in the spring.

TUCKERTON, N. J.—The Brigantine Beach RR. will need a drawbridge on the proposed line. See Railroad Construction column.

VERSAILLES, PA.—A contract has been let by the Boston (Pa.) Bridge Co. to raise its bridge between Versailles and Boston. The contract requires the bridge to be raised 21 ft. This will clear the B. & O. tracks at Versailles and allow the tracks of the Versailles Traction Co. to be extended across the river.

WASHINGTON, D. C.—The Berlin Iron Bridge Co. is reported to have a contract at about \$50,000 for a steel bridge adjoining the present Cabin John bridge at Washington; the new bridge to be 576 ft. long and 14 ft. wide, and used for an electric railroad.

WATERLOO, IA.—It is stated that the Illinois Central will build a viaduct near the Des Moines River bridge.

WILLIAMSPORT, PA.—Viewers have reported in favor of a new county bridge over the river near Linden. It is proposed to build the bridge about 400 ft. east of the Pennsylvania RR. bridge.

WINNIPEG, MAN.—Messrs. Andrews & Maulson of Winnipeg are applying to the Manitoba Legislature to permit the Winnipeg Suburban Park Ry. to build a bridge over the Red River between Winnipeg and St. Boniface.

Other Structures.

CHESTER, PA.—The Franklin Forging & Steel Co., of Allegheny, Pa., has bought land at this place, and it is reported intends building here.

DES MOINES, IA.—It is stated that work will be begun April 1 on the new passenger station and office building to be built by the Chicago, Rock Island & Pacific.

DETROIT, MICH.—The Pere Marquette RR. is receiving bids for remodeling the union depot in Detroit.

EASTON, PA.—The new rolling mill of the Sterlingworth Ry. Supply Co., which is being built by Groman Bros., of Bethlehem, Pa., is about finished and will be in operation by April 1. It is 80 x 250 ft., and will have a capacity of 50 tons per day.

EAST ST. LOUIS, ILL.—The Shickle, Harrison & Howard Iron Co. of St. Louis, Mo., have their new plant at East St. Louis, Ill., about completed. The company expects to begin making steel there within the next 90 days.

LAKE FOREST, ILL.—The Chicago & Northwestern is considering improvements at this point to cost \$100,000, if the city will give permission to occupy the necessary ground and the closing of some streets. Plans are being prepared by Frost & Granger of Chicago for a new station of artistic design to be built of stone, to cost about \$30,000, and to contain all modern improvements and conveniences.

NEWPORT NEWS, VA.—The Chesapeake & Ohio contemplates having its extensive improvements in operation in four months. The improvements will cost in the neighborhood of \$2,000,000.

OTTAWA, ONT.—See Intercolonial Ry. in Railroad Construction column.

SALT LAKE CITY, UTAH.—The City Council has granted franchises to the Oregon Short Line and the Rio Grande Western for the union depot proposed at a cost of not less than \$200,000.

WAUKESHA, WIS.—The plant to be built by the Modern Steel Structural Co. will be of brick and steel. It will be 103 x 250 ft., and cost about \$20,000. Work is to be begun about May 1. S. B. Harding, President, prepared the plans. (March 9, p. 160.)

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xii.)

International Association of Ticket Agents.

This Association met in Atlanta, Ga., March 9. The election resulted in the choice of E. N. Blood, of Buffalo, for President and C. G. Cadwallader, of Philadelphia, Secretary.

Northwest Railway Club.

At a meeting of the Northwest Railway Club, March 13, at the Ryan Hotel, St. Paul, Minn., Mr. T. A. Foque, Assistant Mechanical Superintendent of the Soo Line, presented a paper entitled "Dynamometer Tests of Locomotives."

The New York Railroad Club.

A regular meeting of the New York Railroad Club was held March 15th. At this meeting the paper presented by Mr. W. L. Derr, Superintendent of the Elmira Division, Erie Railroad, was on the subject of "Water Supply for Railway Service."

Engineers' Club of Cincinnati.

At the last meeting of the Club Mr. Wm. C. Green read a paper on "Steam Heating at and Below the Pressure of the Atmosphere." Mr. Green is Manager for the Warren & Webster Co. and his paper embraced a treatment of the subject in general and an exposition of the system of heating as installed by that company.

Civil Engineers' Society of St. Paul.

At regular meeting of the society was held March 5. Mr. Arthur Lipschutz read a paper on "Acetylene for Railway Stations and Train Lighting," and Mr. Max Toitz cited some facts as to train lighting in general. The thanks of the society were tendered and both were requested to prepare their work for publication in the Journal of the Association of Engineering Societies.

Western Railway Club.

A meeting of the Western Railway Club will be held Tuesday afternoon, March 20, at the Auditorium Hotel, Chicago. Prof. C. V. Kerr, of the Armour Institute of Technology, will present the results of tests of an M. C. B. arch bar truck, and a second paper will be "Purchasing Under Specifications," by Mr. Ira C. Hubbell, Purchasing Agent of the Kansas City, Pittsburgh & Gulf.

New England Railroad Club.

The annual meeting of the New England Railroad Club was held in Pierce Hall, Boston, Mass., March 13. The Secretary's report showed the total membership to be 643 active and two honorary members. The average monthly meeting attendance during the past year was 189. The following officers were elected for the ensuing year: President, Henry Bartlett; Vice-President, Chas. F. Baker; Treasurer, Chas. W. Sherburne; Executive Committee: Henry Bartlett, W. P. Appleyard, T. B. Purves, Jr., Prof. C. F. Allen, Chas. F. Baker, F. B. Smith, J. T. Chamberlain, J. S. Turner; F. M. Twombly, J. W. Marden; Finance Committee: Henry Bartlett, W. S. McGowan, Jr., B. M. Jones.

General Charles Miller, President of the Galena Oil Co., Franklin, Pa., addressed the meeting on the subject of "Lubrication." Discussion followed. At the next meeting Dr. C. H. Williams will deliver an address on "Color Blindness."

American Society of Mechanical Engineers.

The spring meeting of the Society will be held at Cincinnati, O., May 15 to 18. Special railroad rates for members attending this meeting will be secured as before on the certificate plan of a fare and a third for the round trip. The program, and circulars giving full information, will be sent to the members later. It is announced that the Cincinnati Musical Festival will take place this year during the week preceding the meeting.

The Secretary has sent out a circular giving information regarding the trip to London and Paris this summer. The Society has been invited by the Institution of Civil Engineers of Great Britain to many social gatherings and technical meetings from July 5 to 10. On Thursday, July 5, the President of the Institution of Engineers of Great Britain will hold an official reception in the Guild Hall in London. The Society will leave London Monday or Tuesday following in special trains for Paris. It has been found impossible to make satisfactory arrangements for a special steamer for the members of the Society, and it is left for each to arrange the details of his trip.

The Engineers' Club of Philadelphia.

A business meeting of the Club will be held on Saturday, March 17, 1900, at 8 o'clock p. m. The paper will be on "The General Chemical Aspects of the Corrosion of Structural Metals, and the Principles Involved in Their Protection." Illustrated by the exhibition of 235 steel and aluminum plates which have been exposed for about two years to the action of fresh and salt water. By Prof. A. H. Sabin, of New York.

At the meeting of March 3, Mr. William S. Vaux, Jr., presented the paper of the evening upon "The Canadian-Pacific Railway from Laggan to Revelstoke, B. C." He described the engineering features of that portion of the Canadian-Pacific Railway which passes through British Columbia, between Laggan and Revelstoke, and illustrated his remarks by a large collection of photographic views projected by the electric lantern. He devoted special attention to an explanation of the snow sheds and the structures built for deflecting avalanches to protect the tracks, and of the methods of filling in and bridging the valleys. The subject was discussed by Messrs. L. Y. Schermerhorn, Walter L. Webb, James Christie and Edgar Marburg.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. A. H. Tinges, Supervisor of the Philadelphia, Wilmington & Baltimore at Wilmington, Del., died March 11.

—Mr. P. Reilly, who recently resigned as Superintendent of Equipment of the Lake Erie & Western (Lake Shore & Michigan Southern), died at Lima, O., March 10.

—Mr. A. D. Page, who on Feb. 1 last became Bridge Engineer of the Great Northern Railway, was born at Orono, Me., Feb. 28, 1866. He graduated in 1886 from the Maine State College (now University of Maine), and has since been engaged in engineering work. In 1895 he entered the service of the Great Northern as Assistant Engineer. The following year he was made Chief Draughtsman in the Bridge Department, which position he held until his recent promotion.

—Mr. H. E. Beasley, who was recently transferred to the President's office of the Canadian Pacific (p. 111), was born Nov. 10, 1862, and entered railroad service in 1881 in the Engineer's Department of the Grand Trunk. Mr. Beasley has served in various departments, mostly as Secretary and Chief Clerk, until 1890, when he became Assistant Superintendent of the Pacific Division of the Canadian Pacific, and in 1897 he was made Superintendent of the Kootenay Section of the Canadian Pacific Division of the same road.

—Mr. William W. King, who on March 1 assumed the duties of General Superintendent of Transporta-

tion and Maintenance of Way and Structures on the Norfolk & Southern, began his service with the road in 1885 as Trainmaster. Before that time he had taken part in the building of a number of railroads in Pennsylvania, Virginia and North Carolina. In 1890 he was made Superintendent of the Norfolk Division of the Norfolk & Southern and on the absorption of the Virginia Beach road he was appointed General Superintendent.

—Mr. Fayette S. Curtis was last week elected Fourth Vice-President of the New York, New Haven & Hartford Railroad, with headquarters at Boston, and will assume his duties May 1. He will have general charge of the engineering work of the system. Mr. Curtis was born in Owego, N. Y., Dec. 16, 1843. He has been Chief Engineer of this road for some years and has had charge of most of the great work of improvement which has been carried on in recent years. Mr. Curtis was elected a member of the American Society of Civil Engineers April 3, 1889, and served as director for the three years beginning January, 1895.

—Mr. Addison C. Rand, President of the Rand Drill Co., died suddenly March 9 at his home in New York City. Mr. Rand was 59 years old and was born in Westfield, Mass. He was a pioneer in the manufacture of steam drills and of air compressing plants and had been one of the most important men in building up the great business of his house. Mr. Rand, besides being a successful business man, was an active and useful citizen. He had been Treasurer of the Engineers' Club of New York continuously since its organization in the early part of 1883. He was also a member of the American Society of Mechanical Engineers, the Union League Club and the New England Society.

—Mr. S. G. Strickland, whose appointment as Division Superintendent of the Chicago, St. Paul, Minneapolis & Omaha Railway was noted in these columns Feb. 23, p. 127, began his railroad career in 1876 on the Canadian Pacific as telegraph operator. In 1878 he became operator at St. Vincent for the St. Paul & Pacific (Great Northern), and the following year entered the service of the Chicago, St. Paul, Minneapolis & Omaha at Stillwater, Minn., as telegraph operator and clerk. In 1898 Mr. Strickland was made Chief Clerk in the General Superintendent's office and the next year became Trainmaster of the St. Paul & Sioux City Division. Mr. Strickland assumed his new duties on Feb. 15.

—Mr. Albert B. Corinth, the new Assistant Superintendent of Motive Power of the Atlantic Coast Line, was born in Philadelphia, Pa., in 1854, and was educated at Girard College. After serving the Pennsylvania Railroad for four years as an apprentice in the car shops at Renovo he spent eight more years in the same shops as journeyman. In 1880 he entered the shops of the Louisville & Nashville at Louisville and four years later took charge of the Freight Car Department of the Ohio Falls Manufacturing Company at Jeffersonville, Ind. Mr. Corinth was then made Master Car Builder at Atlanta, of the East Tennessee, Virginia & Georgia. In 1889 he became Foreman of the Freight Car Department of the Chicago & Northwestern, and later took charge of the Car Department of the Georgia Pacific. Upon the merging of this road into the Southern Railway, Mr. Corinth was transferred to Knoxville in a similar capacity.

—Mr. Charles Henry Coster, of the firm of J. P. Morgan & Co., died last Tuesday morning at his home in New York City. Mr. Coster was born at Newport, R. I., July 24, 1852, and in 1867 began work in the house of a firm of importers. In 1884 he became a partner in the banking house of Drexel, Morgan & Co., and at the time of his death was a partner in J. P. Morgan & Co., Drexel & Co., and Morgan, Harjes & Co. Mr. Coster had been intimately connected with the vast railroad business of J. P. Morgan & Co., and is supposed to have been director in more companies than any other man in the world. His name appears in the lists of directors of at least 59 different corporations, many of them among the most important railroads in the country. His death is said to have been indirectly the result of overwork, although following directly on an attack of pneumonia. He was a man of ability, integrity and the highest moral courage. This latter quality he possessed to a remarkable degree, and added to his ability and energy, it made him one of the most useful men of his generation.

—Mr. Ernest Gray Freeman, Resident Engineer of the New East River Bridge, Manhattan side, died at Augusta, Ga., Tuesday, March 6. Mr. Freeman was born in Buffalo, N. Y., in 1867 and graduated from the Rensselaer Polytechnic Institute in 1888. He at once entered the office of Mr. L. L. Buck, where he remained two years assisting Mr. Buck in the preparation of plans for the bridges over the Genesee River in Rochester and for the Verrugas viaduct in South America. Then for three years he was with Mr. George S. Morison as inspector on the Burlington bridge and as Principal Assistant Engineer on the Bellefontaine bridge over the Missouri. In 1893 he returned to Mr. Buck's office and in 1895 was appointed Resident Engineer on the New East River Bridge. He had charge of the building of the New York tower foundations and designed and nearly completed the New York anchorage. At the time of his death he had charge of the erection of the steel towers and end spans. He was able, thorough and conscientious and showed remarkable tact in handling men. He was a high-minded man and was destined to be, had he lived, not only a distinguished engineer, but a valuable citizen.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—C. G. Sholes, Superintendent of Telegraph, has had his jurisdiction extended over the Atchison lines west of Albuquerque, including the Santa Fe Pacific, the Southern California and the San Francisco & San Joaquin Valley. Andrew Smith, heretofore Superintendent of Telegraph at Los Angeles, becomes Assistant Superintendent of Telegraph.

Atkinson & Northern.—The officers of this company are: President, B. E. Sturdevant; Vice-President, Peter Greeley; Secretary, W. J. Dobbs; Treasurer, C. L. Sturdevant; General Manager, A. O. Perry, and General Attorney, James M. Kerr. (See R.R. Construction column.)

Cedar Rapids, Garner & Northwestern.—E. P. Fox, Superintendent, will also assume the duties of Traffic Manager and Auditor.

Centralia & Chester.—J. K. Connor has been appointed Auditor, with headquarters at Sparta, Ill., succeeding T. D. Hinchcliffe, resigned.

Chesapeake & Ohio.—Geo. H. Ingalls, Assistant to the President, with headquarters at Cincinnati, O., has resigned.

Chicago & Southeastern (of Ind.).—C. M. Ward has been appointed General Manager.

Findlay, Fort Wayne & Western.—A. Strausz, Jr., has been appointed Acting Auditor, succeeding A. B. Merriam, Auditor.

Illinois Central.—W. H. V. Rosing, heretofore Mechanical Engineer, has been appointed Assistant Superintendent of Machinery, a position recently created.

Kansas City, Pittsburgh & Gulf.—F. S. Rawlins, formerly Trainmaster, has been appointed Superintendent of Transportation, succeeding J. J. Merrill, resigned.

Lehigh Valley.—A. A. Heard has been appointed Assistant General Passenger Agent, with headquarters at New York.

George R. Chesbrough succeeds Mr. Heard as Western Passenger Agent, with headquarters at Buffalo, N. Y. Effective April 1.

Los Angeles Terminal.—T. C. Peck, heretofore General Agent of the Passenger Department, has been appointed Assistant General Manager, with headquarters at Los Angeles, Cal.

Marshalltown & Dakota.—M. F. Collins has been made General Manager, with headquarters at Fraser, Ia.

Missouri Pacific.—Russell Harding, heretofore Vice-President and General Manager of the St. Louis Southwestern, has been appointed General Manager of the M. P., succeeding W. B. Doddridge.

Newburgh & South Shore.—C. A. Gallagher has been appointed General Superintendent, with headquarters at Cleveland, O., succeeding R. W. Ney.

New York, New Haven & Hartford.—Fayette S. Curtis, Chief Engineer, has been elected Fourth Vice-President, with headquarters at Boston, effective May 1.

Pennsylvania.—J. H. Tinker has been appointed Master Mechanic, with headquarters at South Amboy, N. J., succeeding Thos. Kerr, retired.

Pennsylvania & Buffalo Connecting.—The officers of this company are: President, Samuel Rea (Fourth Vice-President of the Pennsylvania); Secretary, Albert Hewson; Treasurer, T. Ashton, and Chief Engineer, J. U. Crawford (Engineer Branch Lines of the Pennsylvania). (See R.R. Construction column, March 9, p. 161.)

Pittsburgh, Allegheny & McKees Rocks.—J. V. Maher has been appointed Superintendent and General Freight Agent, effective March 1. The office of General Superintendent is abolished.

St. Louis, Low Grade & Southern.—The officers of this new company are: President, Louis Dudenbostel, Chester, Ill.; First Vice-President and Chief Engineer, H. H. Schwanecke, Marshall, Ill., and Secretary, John Calligan of St. Louis, Mo. (See R.R. Construction column.)

St. Louis Southwestern.—F. H. Britton, General Superintendent, has been appointed General Manager, succeeding Russell Harding, resigned.

Southern.—O. D. Killebrew has been appointed Assistant Engineer at Greensboro, N. C.

Union Pacific.—C. B. Keyes has been appointed Acting Assistant Superintendent at Omaha, Neb., succeeding N. W. Chapman, resigned.

Wrightsville & Tennille.—H. W. Millman has been appointed Auditor, succeeding C. C. Brown, resigned. Effective March 1.

RAILROAD CONSTRUCTION. New Incorporations, Surveys, Etc.

ATKINSON & NORTHERN.—Two hundred of the proposed 504 miles of road have been graded and is ready for the ties and rails. Surveys for location of several branches are now being made. It will require about 30 days to complete grading to the southern connections, working 200 teams. The work is to be begun as soon as the frost is out of the ground. The company is in the market for supplies.

ATCHISON, TOPEKA & SANTA FE.—Application was made about a week ago to the Board of Supervisors of Contra Costa County, Cal., by railroad promoters of Oakland, Cal., for right of way for an electric railroad into Oakland, from the present terminus of the Atchison, Topeka & Santa Fe at Point Richmond. It is believed it is in the interest of the Atchison for entrance into Oakland. The distance is eight miles.

BLACKWELL, ENID & SOUTHWESTERN.—This company has been granted a charter in Oklahoma, with a capital of \$1,500,000, to build a railroad from Blackwell southwest about 55 miles to Enid, on the Chicago, Rock Island & Pacific. Extensions are proposed from Enid, one line going southwest and another southeast. The directors are: W. W. Peckham, E. L. Peckham, C. J. Peckham and T. S. Chambers of Blackwell; C. E. Hunter and O. S. Fleming of Enid; W. C. Robinson, Winfield, Kan.

BOSTON & MAINE.—This company is double tracking about 8½ miles between Springfield, Vt., and Claremont Junction, N. H. Most of the work is being done by the railroad. A few culverts are to be built, but no contracts are to be let.

CALIFORNIA NORTHWESTERN.—The citizens of Cloverdale, Cal., have passed a resolution to co-operate with this company to build an extension from Cloverdale to Anderson Valley, Mendocino County. A survey northward has been made.

CANADIAN ROADS.—Application is being made to the Dominion Parliament for the incorporation of a company to build a railroad from Batchewana Bay, Ontario, on Lake Superior, to the main line of

the Canadian Pacific, thence to James' Bay, near the mouth of the Albany River, and northwest to Fort Churchill, on Georgian Bay.

CENTRAL OF NEW JERSEY.—Surveys have been made and it is stated that work will soon be begun for a spur from Bath Pa., east about four miles to Nazareth; also for a spur track from Bath southwest about five miles to Siegfried on the C. of N. J.

CENTRAL TRACTION CO. OF INDIANA (INDIANAPOLIS).—This company was incorporated in Indiana March 9, with a capital stock of \$1,200,000, to build electric railroads in and connecting Kokomo, Elwood, Atlanta, Cicero, Broad Ripple, Indianapolis and many other places. The headquarters of the new company will be at Anderson, Ind., and the directors are: Chas. A. Ford, Wm. L. Kann, Geo. Lilly, Horace C. Stillwell and Samuel J. Mack.

CHICAGO, WEATHERFORD & BRAZOS VALLEY.—This company has made a contract with the Weatherford Construction Co. of Weatherford, Tex., to build and equip the entire line of railroad. Work will be begun at the junction of the Chicago, Rock Island & Texas in Wise County, Tex., as soon as a few details regarding the right of way are finished. The road is to extend from Bridgeport via Weatherford, Granbury, Glen Rose and Morgan to Waco, Tex., 155 miles. (Nov. 24, 1899, p. 818.)

CHIPPEWA VALLEY & NORTHERN.—This company, recently organized in Wisconsin, will build a railroad from a point two miles north of Bruce, on the Minneapolis, St. Paul & Sault Ste. Marie, where the sawmills of the Arpin Lumber Co. will be located. The company has bought three miles of rails. About 12 miles of road will be built. Work is to be begun early in the spring. (March 2, p. 145.)

CHOCTAW, OKLAHOMA & GULF.—The extension of this line from Weatherford to Custer and Roger Mills County, O. T., and Wheeler, Gray, Carson and Potter counties, Tex., to Amarillo, about 203 miles, will be pushed as rapidly as possible. Locating surveys are being made. F. A. Molter, Chief Engineer.

COLUMBIA & NEHALEM VALLEY.—This company was incorporated in Oregon March 2, to build a railroad, telegraph and telephone lines from St. Helens, Ore., on the Columbia River, southwest about 52 miles, to Nehalem, near the mouth of the Nehalem River in Tillamook County. It is to pass through Pittsburg, Columbia County, Ore. The right to build branch lines where practicable is also granted. The incorporators are Geo. T. Gerlinger, Vancouver, Wash.; Ernest C. Dalton and E. E. Coover, Portland. The capital stock is \$100,000. (Feb. 16, p. 111.)

COLUMBIA (S. C.) UNION STATION.—This company has been incorporated in South Carolina to build and maintain a union station in Columbia. Also to build or lease other railroad terminals, tracks, switches, etc. The capital is \$100,000.

COLUMBUS, LANCASTER & WELLSTON.—This company has filed a mortgage in favor of John W. Dickinson to build an extension from the present northern terminus to Columbus, O., about 20 miles, and also from the southern terminus of the present line to Wellston, O., 17 miles. W. H. Stevenson, Lancaster, O., is President.

CORSICANA & SOUTHEASTERN.—Recent reports are that New York capitalists have secured an interest in this company and will build the proposed line for which surveys are reported in progress from Corsicana, Tex., southeast to Sabine Pass, 220 miles.

DALLES SOUTHERN.—This company filed articles of incorporation in Oregon Feb. 24, to build a railroad along the east slope of the Cascades from The Dalles to Lakeview. Thirty miles of the proposed line from The Dalles to Dufur have been surveyed. E. E. Lytle is President.

DELAWARE, LACKAWANNA & WESTERN.—See General Railroad News column.

FLORIDA ROADS.—The plan for a belt railroad along the river front in Jacksonville, Fla., connecting the Atlantic, Valdosta & Western terminals and the Florida Central & Peninsular is revived. Courtland Buckman and C. S. Hammett have made application for the privilege.

FRANKLIN (TENN.) TERMINAL CO.—A charter was granted this company in Tennessee March 5, to build, maintain, operate or lease other railroads terminal facilities, etc. The capital stock is \$20,000. T. J. Redmond, W. W. Faw, J. B. Lillie, Jr., Sam Webb and E. Curd, Jr., are the incorporators.

GRAND ISLAND & WYOMING CENTRAL.—This company, which was incorporated in 1890, has a resolution before the South Dakota Legislature permitting the company to build several small extensions in Pennington County this year. The original project of this company was to build from Grand Island, S. D., to a point on the Wyoming State line, with an extension from a point in Fall River County to Hot Springs, S. D. A second extension was to be built from a point on the Deadwood County line to Spearfish, S. D. G. W. Holdridge of Omaha, and J. D. Macfarland of Lincoln, Neb., are interested.

GRAND TRUNK.—This company will double-track the line between Hamilton, Ont., and Niagara Falls, about 40 miles, the work to be completed before the opening of the Pan-American Fair in Buffalo, N. Y.

GREAT NORTHERN.—Reports say that surveys are practically completed for an extension from Wenatchee, Wash., to Republic, Stevens County, northeast about 130 miles.

It is stated that the line between Kallispell and Libby Creek, Mont., will be changed. Work will be begun about seven miles west of Kallispell.

HARRIMAN & NORTHEASTERN.—This company will build an extension in Morgan County to reach the coal deposits of the Harriman Land Co. J. E. Rhodes of Harriman, Tenn., is Manager.

HILGARD & GRANITE.—The preliminary survey has been made for 27 miles from Hilgard, Fred. S. Stanley of the Grande Bonde Lumber Co. is one of the promoters.

HUNTINGTON & BROAD TOP MOUNTAIN.—This company has let a contract to M. T. Fogarty & Co. for the change of line from Tatesville, Pa., to Royer's siding, which will do away with a number of trestles and a steep grade. (Oct. 6, 1899, p. 701.)

IDAHO NORTHERN.—Grading has been completed to the Platte River and bids have been asked for grading 10 miles further north. The company has plans for an extension 30 miles further north.

INDIANAPOLIS SOUTHERN.—The route will probably be changed. Surveys are now being made by way of Brownstown, Salem, Paoli and West Baden, with southern terminus at Rockport. The original survey was via Bedford. Capitalists on the route of the new survey have offered right of way and a 2 per cent. subsidy the entire distance; also strong inducements in the way of terminals. (Sept. 1, 1899, p. 619.)

INTERCOLONIAL.—The estimates of the Dominion Government submitted to the House last week include, among many other items, the following for this company: Strengthening bridges, \$100,000; air brakes on passenger cars, \$13,000; air brakes on freight cars, \$40,000; car couplers on passenger cars, \$26,000; equip passenger cars with vestibules, \$10,000; provide machinery at shops, \$5,000; change draw-bars freight cars, \$20,000; additional rolling stock, \$950,000; accommodation and facilities along the line, \$104,000.

KANSAS CITY, FORT SCOTT & MEMPHIS.—It is said that about one mile of extension will be built by the Kansas City, Memphis & Birmingham. About 10 miles of track will be re-laid during the year with 75-lb. rails.

KANSAS CITY, PITTSBURGH & GULF.—Surveys will be made as soon as this company is reorganized, for an extension to Crowley, La.

KENTUCKY ROADS.—The Peach Orchard Coal Co. of Peach Orchard, Ky., will build half a mile of standard gage road to a new coal mine on its property. Surveys have been made and building has already been begun. Some contracts have also been let. H. H. Keys of Ashland, Ky., is in charge of construction. John C. Welty of Canton, O., is President.

The property of the Sterling Lumber Co., Morehead, Rowan County, Ky., has been sold to Ashland, Ky., capitalists and the 25-mile railroad between Morgan and Menifee County, Kentucky, will be repaired.

LAKE ERIE & DETROIT RIVER.—This company proposes to build an extension from Ridgetown, Ont., its present terminus, northeast about 58 miles paralleling the Michigan Central to St. Thomas, Ont.

LEHIGH VALLEY.—This company has bought land in the Newark Meadows, N. J., upon which freight yards will be located.

MANITOULIN & NORTH SHORE.—The Sudbury, Ont., Council has passed resolutions urging the Provincial Government to grant subsidies to this company, which will build from Little Current to Sudbury. (Feb. 2, p. 80.)

MICHIGAN ROADS.—The Isle Royale Copper Co. has made application to the Railroad Commissioner to build a private railroad to connect its mining property with ore docks on Portage Lake; also for permission to cross the Duluth, South Shore & Atlantic at a place called Pilgrim on the Pilgrim River.

MISSOURI, KANSAS & TEXAS.—We are told that the company does not contemplate at the present time building the extension from McKinney, Tex., as stated last week.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—Surveys for an extension of the Sparta branch of about 40 miles from Bon Air in White County, to Pikeville in Bledsoe County, have been completed. The work will probably be done during the summer. The Pikeville branch runs from Chattanooga via Bridgeport, Ala., through the Sequatchie Valley, and by connecting the two branches, the N., C. & St. L. will have two lines between Nashville and Chattanooga.

NEW YORK CENTRAL & HUDSON RIVER.—A bill has been introduced in the House of Representatives to grant the Oswego & Rome RR. right of way through the Fort Ontario Military Reservation in the State of New York. A similar bill has been introduced in the Senate.

NORTHERN CENTRAL OF ARKANSAS.—Surveys have been completed between Winnerva, Ark., and Oregon. About 50 miles of right of way has been secured. The Leavenworth Construction Co., of which Willard E. Winner is President, and one of the promoters of this road, will probably get the contract. (Dec. 1, 1899, p. 835.)

OFFERMAN & WESTERN.—The injunction has been removed restraining this company from crossing the Waycross Air Line near Nicholls, Ga., for an extension to reach the plant of the Southern Pine Co.

OHIO RIVER & CHARLESTON.—The extension of this road from Erwin north into timber lands in North Carolina is expected to be completed by the middle of May. (Oct. 20, 1899, p. 737.)

OREGON SHORT LINE.—The Utah Construction Co. of Ogden, Utah, has the contract for widening embankments, filling bridges, grading side-tracks, etc., for the current year preparatory to ballasting. There is nothing in the report of building any additional lines. About 150 to 200 miles of road will be ballasted this year. (Feb. 23, p. 128.)

PANHANDLE & GULF.—Amended articles of incorporation were filed by this company March 3, increasing its capital stock to \$600,000. The company has bought the Colorado Valley RR., extending from Sweet Water, Tex., south about 25 miles, and proposes to extend it further south to Laredo; also north from Sweet Water via Hardeman County to the Red River. The entire extension will be about 500 miles long. H. C. Hord of Sweet Water is the attorney.

PASCAGOULA & NORTHERN.—This company, the incorporation of which was noted last week (p. 161), has a capital stock of \$250,000 and the following Board of Directors: A. S. Denny, A. P. Denny, J. L. Dantzler, L. M. Dantzler, Jr., O. Randall, Ed Mitchell, C. H. Wood, J. J. Weaver and J. W. Stewart. J. W. Stewart was elected President, L. N. Dantzler, Jr., Vice-President, and C. H. Wood, Secretary and Treasurer.

PENNSYLVANIA COMPANY.—Work has begun on a third track on the Pittsburgh, Fort Wayne &

Chicago for about five miles east and west from Homewood, Pa.

PHILADELPHIA & READING.—The Atlantic City RR., which recently bought property on the south side of Kaighn's Ave., from Front St. to Second, Camden, N. J., proposes to straighten its tracks to the Kaighn's Point Terminal. This will also make room for additional tracks.

Reports state that surveys have been completed for a belt line around the city of Reading, Pa., for the diversion of freight and coal traffic from the present route through the city. A number of bridges will be needed at crossings.

PENNSYLVANIA.—Chas. A. Sims & Co., Philadelphia, are said to have the contract for an extension from the present terminus at the mouth of Brown's Run to Cat's Run, six miles, near Gray's Landing, Green County, Pennsylvania. The extension will open up a new coke field south of Mazon-town, Fayette County.

PRINCE EDWARD ISLAND.—Among the estimates submitted by the Dominion Government in the House last week was \$700,000 for the Murray Harbor branch, including the Hillsboro bridge of this railroad.

PHILADELPHIA & READING.—Work has been begun by this company, extending its double track on the Little Schuylkill branch from New Ringgold to Reynolds, Pa., six miles. The line south from New Ringgold to Dreher'sville, about four miles, will also be double tracked.

PITTSBURGH & FAIRMONT SHORT LINE.—This company was incorporated in West Virginia March 7, to build a railroad from Fairmont via Riversville, northwest about 18 miles to Blacksville, near the Pennsylvania State line in Monongalia County. The capital stock is \$5,000,000. The incorporators are: Thomas W. Fleming, O. S. McKinney, A. H. Fleming and Chas. G. Manley of Fairmont, W. Va.; Thomas A. Neale of Amos, and Frank G. Caldwell of Wheeling, W. Va. Thomas W. Fleming is the Attorney.

ST. LOUIS, LOW GRADE & SOUTHERN.—This company, the incorporation of which was noted March 2 (p. 146), proposes to build a railroad 150 miles long, for which surveys were begun March 7. The road will extend from East St. Louis, Ill., via Chester, to Cairo. The names of the officers are given under Elections and Appointments.

SAN DIEGO & PHOENIX.—A bill is before Congress to grant land to this company, which proposes to build a standard gage railroad from Yuma, Ariz., to San Diego, Cal.

SAN FRANCISCO & SAN JOAQUIN VALLEY.—This company has made application to the City Council of Stockton, Cal., for a franchise for additional tracks through that city.

SANTA FE & GRAND CANYON.—The contract for grading the last 20 miles of this road has been let to R. R. Coleman. (Dec. 15, 1899, p. 872.)

SEABOARD AIR LINE.—This company will begin works on the new Chattanooga, Augusta & Southern Air Line as soon as the work at Columbia, now in progress is done. Surveys for this 125-mile extension are completed. (Sept. 1, 1899, p. 620.)

SOUTH CAROLINA ROADS.—A bill is before the South Carolina Legislature to authorize the Clemson Agricultural College of South Carolina, in Oconee County, to build and operate a railroad between the college and Calhoun Station, about two miles northeast, to connect with the Atlanta & Charlotte Air Line, or any other road as deemed practicable.

SOUTHERN.—Preliminary surveys have been made for an extension from Allendale, S. C., about 52 miles to Hardeeville, which is 23 miles from Savannah, Ga. The road will extend from Barnwell County into Hampton County, crossing the Florida Central & Peninsular near the county line.

SOUTHERN PACIFIC.—The Central Pacific has made application to the City Council of Stockton, Cal., for a franchise for additional right of way through that city.

SUWANNEE & SAN PEDRO.—The Drew Lumber Co., Columbia, Fla., has the contract for building and equipping this railroad. Five miles of road have been graded and track laying will shortly be begun. The road is to run from Live Oak in Suwannee County, south through Lafayette County to Stevensville on the Gulf of Mexico, about 60 miles, with a branch line running west to Perry in Taylor County. At present the road will be built from Suwannee southwest, passing through Mayo to Steinhatchee, where a large turpentine and naval stores plant is located. The company has a contract to haul naval stores from this and other naval stores plants, as well as other large contracts. A bridge will be needed across the Suwannee River at a point where the Drew Lumber Co. will build a sawmill. The town will be known as Wilmarth. Geo. L. Drew, Columbia, Fla., is President of the lumber company.

TENNESSEE NORTHERN.—We are told that there is no truth in the report that an extension is proposed to Middlesboro, Ky., as erroneously stated in this column last week.

TEXAS ROADS.—The Texas & Pacific Coal Co. will build a railroad south from Thurber, Tex., into Llano and Erath counties. Edgar L. Marston is President. The office is at Fort Worth.

TORONTO & GEORGIAN BAY.—Messrs. Watson, Smoke and Smith, of Toronto, Ont., give notice of an application to Parliament for a charter to build a railroad line from Toronto to Georgian Bay.

TREDEGAR MINERAL.—We are told that it is the intention of this company to build the line from Jacksonville, Ala., to a point 10 miles north, this summer. Four miles have already been built. The rest of the line has been surveyed. The work will be comparatively easy. Joseph W. Burke, President and Manager, Jacksonville, Ala.

GENERAL RAILROAD NEWS.

BALTIMORE & OHIO.—The Finance Committee of the Maryland Senate has reported favorably a resolution directing the Attorney-General to take action to protect the interest of the State in the Washington branch of the Baltimore & Ohio RR.

CHICAGO JUNCTION RYS. & UNION STOCK YARDS CO.—This company will issue 4 per cent. bonds to retire the \$10,000,000 of 5 per cent. mortgage bonds now outstanding and to make necessary extensions and improvements. The company has bought one-quarter interest in the recently constructed Calumet & Western RR. The other interests are owned principally by the Rock Island, Michigan Central & Pennsylvania.

COLORADO VALLEY.—See Panhandle & Gulf in Railroad Construction column.

COLUMBUS, SANDUSKY & HOCKING.—Joseph Robinson, the present Receiver of this company, has been appointed by Judge Taft as Special Master to sell this road, on the suit of the Metropolitan Trust Co. of New York, at a time to be fixed hereafter. The upset price is \$2,750,000. The present C., S. & H. is a reorganization of a company of the same name, foreclosed in 1895. It runs from Sandusky, O. (reaching Toledo by trackage rights), south through Columbus, to the coal-fields in southern Ohio. The present order for foreclosure has been preceded by long litigation between various interests. A plan of reorganization was issued in May, 1898, but in the following year abandoned. The first receiver was N. Monserrat. He was displaced in June, 1899, by Judge Taft of the United States Court, who placed S. M. Felton in control. He continued as receiver until after his election as President of the Chicago & Alton, when Judge Taft appointed the present receiver. The certificates issued by Receiver Monserrat, about \$500,000, during the earlier receivership, were held by the report of the Special Master appointed by Judge Taft not to have any lien on the property of the present company. He found that the foreclosure decree of 1895 did not reserve any lien to such certificates when ordering foreclosure in 1895. The same report found the amount of the prior lien mortgage to be \$2,250,000 and of the general mortgage \$3,192,901.

DELAWARE, LACKAWANNA & WESTERN.—The stockholders of the Morris & Essex RR. have voted to make a first and refunding mortgage for an amount sufficient to retire at maturity all the existing bonds, and to provide funds for necessary improvements and additions.

DELAWARE VALLEY & KINGSTON.—In the suit in equity against the Erie & Wyoming Valley and the Pennsylvania Coal Co. by the Erie to prevent the building of a projected independent railroad, the complainant alleges that the E. & W. V. entered into an agreement with the Erie on Feb. 23, 1898, whereby the Erie was to transport coal for the Pennsylvania Coal Co. over the E. & W. V. until Dec. 31, 1909. It is now averred that the defendant companies are to build a railroad between Hawley and Lackawaxen, Pa., to transport coal for the Pennsylvania Coal Co. (March 9, p. 162.)

DENVER & SOUTHWESTERN.—This company has given a general mortgage for \$5,500,000 in favor of the Continental Trust Co., New York. The mortgage covers all the railroad's capital stock, as well as real estate and other property, and secures an issue of 5 per cent. bonds due 1929.

KANSAS CITY, OSCEOLA & SOUTHERN.—This company, which affords an inlet to Kansas City, Mo., for the St. Louis & San Francisco from Bolivar, and which has been operated by the Frisco under lease for about two years, has passed into the control of that company. The K. C., O. & S. was owned by the late John I. Blair of New Jersey. The road will be rebuilt, using 85-lb. rails.

LEBANON SPRINGS.—The sale has been postponed until March 21. It is believed that it will be bought in in the interest of the Chatham & Lebanon Springs, formerly a part of this road. (Feb. 23, p. 128.)

MANUFACTURERS RAILROAD (TOLEDO).—It is rumored that the controlling interest of this road along Water St., Toledo, O., has been sold to representatives of the Vanderbilt and Pennsylvania lines, on a valuation of \$1,000,000.

PENNSYLVANIA.—At the annual meeting of the stockholders March 12, the action of the directors in increasing the capital stock on Dec. 13 was approved; also the directors' action in investing the company's funds in the capital stock of the Erie & Western Transportation Co. at par, amounting to \$3,000,000, and in other securities of the same company to the amount of \$475,000. (March 9, p. 162.)

QUEEN ANNE'S.—A bill has been introduced in the Maryland Senate to authorize this company to change its name to the Baltimore & Delaware Breakwater RR. Co., and to increase its bonded debt to not more than \$30,000 per mile. The present bonded debt is \$15,000 per mile. The road is 60 miles long, extending from Queenstown, Md., to Lewes, Del. A 54-mile extension is being built north from Queenstown, and another extension of six miles is being built south from Lewes.

RUTLAND.—The report that the United Counties Ry. has been bought by the Rutland has been denied by Treasurer Henry G. Smith of the Rutland.

A mortgage for \$1,000,000 has been made by the Rutland Transit Co., which is controlled by the Rutland RR. The transit company is successor to the Ogdensburg Transit Co., which owns wharves, freight sheds and eight freight steamers.

SHELBYVILLE & BLOOMFIELD.—This road has been sold at Commissioners' sale at Shelbyville, Ky., to T. Booker Reed, representing the bondholders, for \$25,001, subject to a mortgage of \$446,000. The road is 27 miles long.

YOUGHIOGHENY.—An answer to the bill in equity at Pittsburgh, Pa. (Jan. 12, p. 30) by the Penn Gas Coal Co. against the Pennsylvania RR. Co., was filed March 7. The action is to restrain the consummation of the sale of the Youghiogheny Ry. to the defendant company for \$380,000. It is alleged that the directors of the plaintiff company acted without authority in selling the property. In the answer signed by President A. J. Cassatt, it is claimed that at the time of the agreement the Pennsylvania paid to the complainant \$10,000 on account of the total compensation. The residue of the agreed price, viz., \$370,000, was stipulated by the agreement to be paid on or before the first day of January, 1900. Tender was made and declined, and the defendant company is ready to make payment of the balance due.